THE IRON TRADE REVIEW

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HEAVIEST ORDERS

IN HISTORY OF CARNEGIE STEEL CO. BOOKED LAST WEEK.

American Bridge Co. Expects to Make a New Annual Record—Ore Docks in Good Condition—Effects of Mild Weather on Coke and Scrap.

The Carnegie Steel Co. last week booked the heaviest tonnage of structural steel of any week in its history, in spite of the fact that it was unable to promise delivery on any of the material before three or four months, while in some instances shipments will be delayed fully six months. The American Bridge Co. expects to book enough orders this week to make the total for the year a new record. While activity in other finished materials is not as pronounced as in structural shapes, specifications continue to be very heavy and the market does not show any indication of weakness.

Sales of rails during the past ten days aggregate nearly 200,000 tons, a remarkable total in view of the heavy orders already on the books. Among the recent sales were: Erie, 52,000 tons; West Maryland. 5,000; Florida East Coast, 16,000; Gainesville Midland, 3,500; Oklahoma railroad, 15,000; trolley roads, 15,000 to 20,000 tons.

The eastern bar iron manufacturers have reaffirmed their official price of $30.00 on bar iron, but are exacting premiums of from $5.00 to $10.00 per ton, depending upon the size of the order. In the Central West the quotation of the principal producer is still $40.00 Youngstown, but Indiana mills are selling at lower prices.

Although reports of the holiday lull come from nearly all other pig iron centers, there is considerable activity at Pittsburg. One sale of 10,000 tons, of which 7,500 was basic and the remainder Bessemer, was made at $17.50 valley furnace; while sales of 2,500 tons of Bessemer at $17.65 and the same amount at $17.75 are reported. There is a strong demand for basic iron in the east. The arrival of several car loads of English low phosphorus iron has had some effect on the demand for that grade.

The scarcity of crude steel continues, and a large sale of Bessemer billets at over $27.00, Pittsburg, is reported.

Continued revolutionary troubles in Russia do not furnish much prospect that conditions in regard to ferro-manganese will be improved. There seems to be little probability that the prediction of a plentiful supply by July 1 will be realized. The market is now nominal, but there is no doubt that $150.00 would be paid, if any were offered.

The unusually mild weather for this time of the year has facilitated the movement of coke and scrap, and they furnish the exception to the rule of prices not sagging. Quotations on both are tending downward.

The buying of ore stopped as suddenly as it started. It is estimated that many eastern consumers have not covered for more than half of their requirements, and as Bessemer ores have been sold and the supply of non-Bessemer is limited, sellers are wondering where eastern buyers expect to obtain their ore. Statistics of receipts of ore for the season at Lake Erie ports show a total of 29,012,754 tons, an increase of more than 11,000,000 tons over the receipts for 1904; while the ore on dock is 6,746,410 tons, an increase of only 1,000,000 tons over last year, showing that the movement directly from the vessels to the furnace has been at an unprecedented rate.

SCHWAB'S PLANS.

Include the Expenditure of $12,000,000 on Bethlehem Steel Works.

Concerning his plans for the Bethlehem Steel Co., Chas. M. Schwab has said: "What I am going to do is to make the Bethlehem Steel Works the greatest steel plant in the world. By that I mean the largest, the most modern, the best equipped, the most highly specialized and, I fear also, the most expensive steel works anywhere.

"The existing plant will be more than doubled in size by the building of a structural steel department. This will be equipped with special machinery of entirely new design and capable of manufacturing structural steel in a different way from any now followed.

"Fully $12,000,000 and probably more, besides what is realized from the bond issue, will be required to extend the Bethlehem Steel Works as projected. The new structural plant will be located to the east of the present works.

"For the purpose, we have bought 400 acres of land adjoining. It should not take more than a year and a half to complete the new plant. Additional open-hearth furnaces will be included."

PIG IRON MARKET STRONG.

(Special Telegram.)

New York, Dec. 27.—The pig iron market is remarkably strong for this season of the year. There are many inquiries from heavy melters. Sales include several thousand ton lots of basic and 6,000 of forge, the transactions being at recent high quotations.

THE WEEK IN IRON CENTERS.

PITTSBURG.

Record Breaking Week for Shapes by the Carnegie Steel Co.—Activity in Basic and Bessemer.

OFFICE OF *The Iron Trade Review*,
521 PARK BUILDING, December 27.

The quiet which usually prevails about the Christmas holidays was not as much in evidence this year as is generally the case. Considerable business has been transacted and Bessemer pig iron is the strongest feature and is attracting as much attention now as did the heavy contracts for structural shapes and finished material some months ago. The heavy specifications for finished material are now old stories and pig iron has the center of the stage. Inquiries for good round tonnages are being received right along and there is a well defined feeling of unrest as to the supply and producers are doing everything in their power to prevent a run away market which would result from continued heavy buying at this time. One contract for 10,000 tons divided into 7,500 tons of basic and 2,500 tons of Bessemer sold at $17.50 valley furnaces, one lot of 1,000 tons standard Bessemer for delivery over the first half went at the same price, one sale of 2,500 tons of Bessemer is reported sold at $17.65 and the same source reports a sale of over 2,500 at $17.75. 4,000 tons of gray forge iron sold at $17.35 Pittsburg. It is reported that the Midvale Steel Co., last week imported from England 3,000 tons of low phosphorus iron.

The eastern iron manufacturers at a meeting in New York last week reaffirmed their official price of 1.50c base on bar iron, but all are exacting premiums of from $5 to $10 per ton depending upon the size of the order. The leading interest has decided not to advance its prices on finished material at this time. A reorganization of the American Sheet & Tin Plate Co., is expected shortly after the first of the year when President John A. Topping's resignation takes effect. First vice president C. W. Bray will probably succeed him.

Last week, from the standpoint of orders booked for structural shapes was the largest in the history of the Carnegie Steel Co. Enough business is now on the books to practically keep the mills busy for the whole of 1906 and the same may be said of plates. The scarcity of semi-finished material is as much in evidence as heretofore and a large sale of Bessemer billets is reported at over $27. A fair tonnage of open-hearth forging billets sold at $35. The demand for merchant steel is very heavy and premiums of $2 and $3 are being regularly secured and in some instances consumers rushed for material have paid a $4 premium.

Pig Iron.—Bessemer pig iron is the strongest feature in the market and there is a fear, as reported last week, of a scarcity after the first of the year for first quarter delivery and in some instances this feeling extends to second quarter delivery. The inquiries have been heavy for both Bessemer and basic and foundry iron has been stronger than for some time past, one sale of 4,000 tons of gray forge being reported at $16.50 valley furnace, or $17.35 Pittsburg. Four thousand tons of Bessemer sold in three orders at $17.50, furnace and over half that much sold at $17.75. Several large consumers of Bessemer iron are ready to buy, but fear to come into the market at this time figuring that it would cause a sharp advance and possibly a runaway market, which both producer and consumer are trying to avoid. The Bessemer Pig Iron Association during the past week was continued for another year with the same executive committee. We quote:

Bessemer Valley	$17.50 to 17.75
Bessemer, Pittsburg	18.35 to 18.60
No. 1 Foundry, Pittsburg	18.60 to 18.95
No. 2 Foundry, Pittsburg	18.10 to 18.35
Gray Forge, Pittsburg	17.10 to 17.60
Basic, Valley	17.25 to 17.50
Basic, Pittsburg	18.10 to 18.35

Ferro-Manganese.—Market conditions as far as ferro-manganese is concerned have not materially changed as there is none to be had for prompt shipment and quotations are, therefore, but nominal although there is no doubt $150 could be obtained. The continued trouble in Russia has shaken the belief of those who predicted a plentiful supply by July 1, next year and most of the brokers and importers are not making any quotations.

Skelp.—The transactions have not amounted to much during the week and on grooved iron skelp 1.70 was refused on the offer of a 5,000 ton contract, the producer holding for 1.75 and the deal was not closed. We quote as follows: Bessemer, grooved, 1.65c to 1.70c; sheared, 1.70c to 1.75c; Basic, grooved, 1.65 to 1.70c; sheared, 1.70c quote: Beams and channels, 15 inches and under, 1.70c;

Muck Bar.—With the prevailing high price, $32, delivered Pittsburg, being quoted, there has been but little activity in muck bar. The supply is not plentiful by any means.

Structural Material.—The business of the leading interest during the past ten days has been the largest in the history of the concern, in spite of the inability to promise delivery short of three or four months on anything and in some instances delivery being postponed six months. The mills are running to capacity on structural shapes and there is considerable talk of new capacity, plans for which have been drawn but no announcement will be made until after all details have been determined. We quote: Beams and channels, 15 inches and under, 1.70c; over 15 inches, 1.80c; zees, 1.70c, 1.75c; angles, from 3 to 8 inches, inclusive, 1.70c; universal and sheared plate, 6¼ inch and wider, 1.60c, base.

Billets.—While $26.50 strong is being quoted as the nominal market there is but small likelihood that Bessemer billets could be secured at this figure. A fairly large contract is reported at better than $27 and a sale of open-hearth forging billets has been made at $35, while the market is quoted nominally at $27 and $28.

Plates.—Aside from the continued good business and a steady pressure of new specifications there have been no special features in this market during the week, although the bookings have been unusually heavy, showing no decrease on account of the holiday season. We continue to quote: Tank plate, ¼ inch thick, 6¼ inch to 100 inches, 1.60c, f. o. b. mill, Pittsburg. Extras are as follows per 100 pounds: Flange and boiler steel, 10c; marine, A. B. M. A. and ordinary fire box, 20c; still bottom, 30c; locomotive fire box, 50c; plates over 100 inches up to 110 inches in width, not less than 5c extra; plates 110 inches to 115 inches wide, not less than 10c extra; 115 to 120 inches, not less than 15c extra; plates 120 inches to 125 inches wide, not less than 25c extra; plates 125 inches to 130 inches, not less than 50c extra; plates 130 inches wide, not less than $1 extra; plates 3-16 inch thick, 10c extra; gauges 7 and 8, 15c extra; No. 9, 25c extra. Five cents extra for less than carloads. Terms net cash in 30 days, and for all points of delivery in the United States expect Pacific Coast.

Sheets.—Prices have not changed and business with

both the leading interest and independent manufacturers continues to flourish. New business in satisfactory quantities is being received in fair volume and the only plants of the leading interest not in operation are those out for repairs or for which an adequate supply of raw material cannot be assured. We continue to quote unchanged:

American Bessemer steel sheets box annealed, cold rolled, one pass: Nos. 11-12, 1.90c; Nos. 13-14, 1.95c; Nos. 15-16, 2c; No. 17-21, 2.05c; No. 22-24, 2.10c; Nos. 25-26, 2.15c; No. 27, 2.20c; No. 28, 2.30c. Galvanized Nos. 10-11, 2.25c; Nos. 12-14, 2.35c; Nos. 15-16, 2.45c; Nos. 17-21, 2.60c; Nos. 22-24, 2.75c; Nos. 25-26, 2.95c; No. 27, 3.15c; No. 28, 3.35c. Corrugated roofings, 1.70c per square for No. 28, painted, 2½ inch corrugation; 2.95c per square for No. 28, galvanized, 2½ inch corrugation. Quotations f. o. b. Pittsburg for large lots.

Pipes and Tubes.—Business continues good in all lines with the possible exception of pipe line goods, the demand for which is curtailed until spring by weather conditions. There is but little going on in oil country goods, but in all sizes of merchant pipe and boiler tubes the demand is equal to the supply and the leading interest is not selling ahead further than Feb. 1. We quote:

	Steel		Iron	
Consumers' Carloads	Black	Galv.	Black	Galv.
⅛ and¼ inch	71	55	68½	52½
⅜ and ½ inch	75	63	72½	60½
¾ to 6 inches	79	69	77	67
7 to 12 inches	74	59	72	56½
EXTRA STRONG PLAIN ENDS.				
⅛ to ¼ inch	64	52	61½	49½
⅜ to 4 inches	71	59	68½	56½
4½ to 8 inches	67	55	64½	52½
Double extra strong plain ends, ⅜ to 8 inches	60	49	75½	49½

MERCHANT BOILER TUBES, CARLOADS, 22 FEET AND UNDER.

	Steel	Iron
1 to 1¼ inches	44	41
1¼ to 2¼ inches	56	41
2½ inches	58	46
2¾ to 5 inches	64	53
6 to 13 inches	56	41

Less than carload lots two points less.

2½ inches and smaller, over 18 feet, 10 per cent net extra.
2¾ inches and larger, over 22 feet, 10 percent net extra.

Merchant Steel.—Makers of agricultural machinery are expected to come into the market with heavy specifications about the latter part of January. Current business is flourishing and premiums of $2 to $3 are being exacted in many instances and premiums of $4 have been paid for quick delivery. The demand for shafting and tool steel is particularly heavy. We quote:

Cold rolled and ground shafting, 50 percent off in carload lots, and 45 off in less than carloads, delivered in base territory; tire steel, 1.70c; open-hearth spring steel, 2.25c to 2.50c; sleigh shoe flat, 1.50c to 1.55c; smooth finished machinery steel, 1.70c to 1.75c; toe calk, 2c to 2.05c. The price of planished and machine straightened tire is 1.70c base half extras as below. Iron finished tire up to 1½ inch by ½ inch, 1.65c base half extra tire list. Iron finished tire 1½ inch by ½ inch and over to be sold on regular bar basis of 1.50c base, half extras steel card.

Rails and Track Material—Within the past week one or two heavy orders for rails, standard sections, have been placed and the demand for light sections continues in fair volume. Despite the output of the new mill at the Edgar Thomson plant deliveries are from five to seven months behind. We quote:

Fifty pounds and heavier, 500 ton lots and over, $28; carloads and less than 500 tons, $30; less than carload lots, $32; light rails, 16 pounds, $29; 20 pounds, $27.50 to $28; 25 to 45 pounds, $27; angle bars for standard sections, 1.50c; spikes, $2.

Merchant Bars.—There have been but few transactions in iron bars reported in this district during the week, but the local market is still quoted at 2c Youngstown, or 2.05c Pittsburg. Eastern iron makers at their recent market reaffirmed their old official price of 1.50c base, but all are exacting a premium of from $5 to $10 per ton, depending on size of orders. We quote:

Common iron bars, 2c, Youngstown; 2.05c, Pittsburg; hoops, 1.85c in carload lots, and 1.95c in less than carload lots, with regular hoop card for extras. Bands, 1.50c; Bessemer steel bars, 1.50c; open-hearth steel bars, 1.50c; plow and cultivator, 1.50c, net; channels, angles, zees and tees under 3 inches, 1.60c, all f. o. b. Pittsburg. The following differentials are maintained on steel: Less than 2,000 pounds, 10c advance; less than 1,000 pounds of a size, 30c advance.

Wire and Wire Nails.—The specifications of jobbers on their old contracts continues unabated and the stocks at mills are reported to be almost nothing. The advance was not made this week, but it is expected within the next ten days. We quote:

Wire nails, jobbers' carload lots, $1.80; retailers' carload lots, $1.85, and less than carloads, $1.95; painted barb wire $1.95 for jobbers in carloads; retailers' carload $2, and less than carloads $2.10, with 30c for galvanizing. Annealed smooth fence wire is held at $1.65, with the usual differentials to retailers for carloads and less than carloads. Quotations are all f. o. b. Pittsburg, 60 days, with 2 percent discount for cash in 10 days. Iron and steel cut nails, $1.75 to $1.80.

Old Material—Business has been extremely light and several consumers who are covered for some time ahead have asked that shipments to them be stopped until after the first of the year. We quote as follows:

Heavy melting stock, $17.50 to $18; old steel rails, long lengths, $18 to $18.50; No. 1 cast scrap, $15 to $15.50; heavy cast scrap borings, $10.75 to $11; bundled sheet scrap, $15.50 to $15.75; No. 1 wrought scrap, $20.50 to $21; low phosphorus scrap, $20 to $21.

Coke.—Furnace coke for spot delivery is quoted at $2.65 and for delivery throughout next year at $2.50 to $2.75. For delivery through the first six months from $2.75 to $3.10 is quoted. For foundry coke $3.70 to $3.80 is quoted on contracts for the first three months and $3.50 to $3.75 for prompt. Most of the big contracts have already been placed. For the week ending December 22 the production of the Connellsville region was 282,888 tons and for the lower Connellsville region 90,441 tons. During the week 22,168 ovens out of a total of 23,313 were reported in blast.

CHICAGO.

High Cost of Materials Will Cause Change of Court House Plans.—Market Quiet but Strong.

Office of *The Iron Trade Review*,
1164 Monadnock Block, December 27,

The last week of the year finds most iron and steel products extremely strong. December has been a quiet month so far as new tonnage is concerned, and in the light of experience it was natural for some weakness to develop. But the market has resisted all bearish influences, and with the exception of coke and scrap, prices of other products today are as strong as when trading was at its height. The two materials excepted have been adversely influenced by the open weather that has prevailed for the past thirty days, which has facilitated the production and delivery of both to an unexpected degree. The condition of finishing mills at this time is extremely promising. All are sold up for varying periods from three to nine months. Rail mills have their output sold for the entire year. Furnaces are in as strong a position as mills, and neither in the south nor the north can much iron be obtained for delivery in the first half. The scarcity of crude steel in this market con-

tinues very pronounced with no relief in sight for at least three months. Trading last week was light, but no let-up was noted in the volume of specifications. These exceed the output of mills from 25 percent to 50 percent, and so long as this congestion continues there can be no fear of a slump in prices. The bids for the 10,000 tons of structural steel required in the construction of the new County Court House in this city, mentioned a week ago have been withdrawn because of the high cost of materials, and the plans will be changed to provide for a less quantity of steel. Demand for light rails has been good all through the month, and deliveries on new business cannot now be obtained from the Western mill inside of three to four months. A 15,000 ton contract for standard sections was received last week from an Oklahoma railroad.

Pig Iron.—To all intents and purposes, the market has lapsed into a state of coma. Occasionally, an inquiry comes out, but it is either insignificant in tonnage or for the purpose of sounding conditions. December was never known to be an active trading month, and the week between Christmas and New Year is always the dullest of the four. The market, however, was never stronger, and owing to the shortage of iron, advances are looked for early in the year. No weakness has developed as a result of the apathy in trading. Instead, it has served to show how strong is the pig iron situation. Northern No. 2 is still quoted at $19 furnace, which means from $19.25 to $19.50 Chicago, according to the point of delivery in this city. Southern iron is firm at a minimum of $14.50 Birmingham for No. 2, with sales frequently made at $15. Excepting from certain sections in Virginia and Alabama, where the labor and car scarcity have become serious, deliveries of iron have been excellent, the operation of furnaces being greatly aided by the mild weather that has prevailed to date. Our quotations are as follows:

Lake Superior charcoal	$20.00 to 20.50
Northern Foundry No. 1	19.75 to 20.00
Northern Foundry No. 2	19.25 to 19.50
Northern Foundry No. 3	18.75 to 19.00
Northern Scotch Foundry	20.00 to 20.50
Ohio Strong Softeners No. 1	20.30 to 20.80
Ohio Strong Softeners No. 2	19.80 to 20.30
Southern Foundry No. 1	18.65 to 19.15
Southern Foundry No. 2	18.15 to 18.65
Southern Foundry No. 3	17.65 to 18.15
Southern Foundry No. 4	17.40 to 17.90
Southern No. 1 Soft	18.65 to 19.15
Southern No. 2 Soft	18.15 to 18.65
Southern Gray Forge	16.65 to 17.15
Southern Mottled	16.40 to 16.65
Southern Silveries (4 percent 6 percent Silicon)	19.15 to 19.40
Jackson Co. Silveries 6 %, 21.30; 8 %, 22.80; 10 %,	24.30
Alabama and Georgia Car Wheel	22.65 to 23.15
Malleable Bessemer	20.00
Malleable Bessemer	19.50 to 20.00
Basic Iron	18.90 to 19.15

Billets:—Demand for forging billets greatly exceeds the supply. Only one local mill has any for sale. These are held at a minimum of $35 Chicago. Wire rods are scarce and firm at $33 Pittsburg; chain rods, $35.

Bars.—Specifications for iron and steel bars are of good volume. The holiday season seems not to have affected the demand for either of these products as consumers have pressed mills eagerly for shipments right through this period. New tonnage in steel is naturally light, but for iron it is of good volume, several round lots having been booked in the week under review. Very few mills shut down this year for the Christmas and New Year holidays owing to the congestion of specifications on mill books. Prices are extremely strong and varying premiums are paid for early shipments of steel. We quote carload lots, mill shipments, Chicago delivery, as follows: Bar iron, 1.85c to 2c; soft steel bars and bands, 1.66½c, half extras; soft steel angles less than 3 x 3, 1.76½c; hoops, 2.01½c; base, full extras; hard steel angles, 1.70c to 1.80c. Jobbers' prices are very firm as follows: Bar iron, 2c to 2.10c full extras; soft steel rounds and squares, 2 inches and larger, $2 per 100 pounds base; flats, 2 inches and 4 inches x 1⅛ inch and thicker, $2 per 100 pounds base; flats, 4⅛ inches x 5 inches and 6 inches x 5-16 inch and thicker, $2 per 100 pounds base; all ovals, half ovals and half rounds, $2 per 100 pounds base; steel bands, 1.95c to 2c half extras; soft steel hoops, 2.30c to 2.40c full extras. Other sizes not mentioned above, $1.85 per 100 pounds base, plus half extras.

Sheets.—Shading of light sheets is still done by local sellers, but nothing better than 2.41½c for No. 28 gauge Chicago is offered, a reduction of $1 a ton from the schedule of the leading producer. Blue annealed sheets are strong at official prices. New business is quiet, as is to be expected, but specifications are active and large. Our prices are without change, and for carload lots, mill shipments, Chicago delivery, are as follows:

Blue annealed, Nos. 8, 9, 10, 1.86½c; Nos. 11-12, 1.91½c, Nos. 13-14, 1.96½c; Nos. 15-16, 2.06½c. Box annealed, Nos. 18-20, 2.16½c to 2.21½c; Nos. 22 and 24, 2.21½c to 2.26½c; Nos. 25 and 26, 2.26½c to 2.31½c; No. 27, 2.31½c to 2.36½c; No. 28, 2.41½c to 2.46½c; No. 29, 2.55½c to 2.61½c. Jobbers report a good business and that store prices are firm. We quote as follows: No. 10, 2c to 2.10c; No. 12, 2.05c to 2.15c; No. 14, 2.10c to 2.20c; No. 16, 2.20c to 2.30c; Nos. 18 and 20, 2.40c to 2.50c; Nos. 22 and 24, 2.45c to 2.55c; No. 26, 2.50c to 2.60c; No. 27, 2.55c to 2.65c; No. 28, 2.65c to 2.70c; No. 30, 3.15c to 3.35c.

Quotations on galvanized sheets mill shipments, carload lots, Chicago delivery, are as follows: Nos. 10 and 11, 2.36½c to 2.41½c; Nos. 12 and 14, 2.46½c to 2.51½c; Nos. 15 and 16, 2.56½c to 2.61½c; Nos. 17 and 21, 2.71½c to 2.76½c; Nos. 22 and 24, 2.86½c to 2.91½c; No. 26, 3.06½c to 3.11½c; No. 27, 3.26½c to 3.31½c; No. 28, 3.46½c to 3.51½c. From store, galvanized sheets are quoted as follows: Nos. 10, 12 and 14, 3c to 3.10c; Nos. 16, 18 and 20, 2.90c to 3c; Nos. 22 and 24, 3.05c to 3.15c; No. 26, 3.25c to 3.35c; No. 27, 3.45c to 3.55c; No. 28, 3.65c to 3.75c.

Plates.—Little, if any change, is to be noted in the local situation. Specifications show a slight decrease and new business is dull. The South Chicago mill can now give deliveries in from one month to six weeks' time. Prices are firm and without change; we quote carload lots, mill shipments, Chicago delivery, as follows: Tank steel, ¼-inch and heavier, up to 100 inches wide, 1.76½c base; flange steel, 1.86½c base; marine steel, 1.96½c base; all full extras. Plates, 3-16 inch thick, $2 extra; gauges, 7 to 8, $3 extra; No. 9, $5 extra. Less than carload lots, $5 extra. Local jobbers report a stiff demand from stock and prices are very firm. We quote tank steel, ¼-inch and heavier, up to 72 inches wide, 2c to 2.10c; 72 inches to 96 inches wide, 2.10c to 2.20c; 3-16 inch up to and including 60 inches wide, 2.10c to 2.20c; 3-16 inch to 72 inches wide, 2.35c to 2.45c; No. 8, up to 60 inches wide, 2.25c; flange steel, 25c extra; heads, 25c extra.

Structural Steel.—All the bids for the new County Court House, to be erected in this city, next summer, have been withdrawn because of the high cost of materials. It is expected the plans will be changed to provide for about 2,500 tons less of structural steel than originally contemplated. Specifications on mills continue extremely heavy; new business is also of good proportions. Deliveries of heavy beams and channels cannot be given inside of six months; and on lighter shapes at least nine months is required. Prices are very strong. We quote mill shipments, f. o. b. Chicago, as follows: Beams and channels, 3 to 15 inches, inclusive, 1.86½c; angles, 3 to 6 inches, 1.86½c; angles, larger than 6 inches, on one or both legs, 1.96½c; beams, larger than 15 inches, 1.96½c; zees, 3 inches and over, 1.86½c; tees, 3 inches and over, 1.91¼c,

with the usual extras for cutting to exact lengths, punching, coping, bending, or other shop work. Quotations on lots from store are as follows: all angles, 3 inches and larger, $2.25 per 100 pound base; tees, 3 inches and larger, $2.30 per 100 pounds base; 3, 5, 9, 12 and 15 inch beams, $2.25 per 100 pounds base; 4, 8 and 10 inch beams, $2.50 per 100 pounds base; 6, 7, 18, 20 and 24 inch beams, $2.75 per 100 pounds base; 3 4, 9, 12 and 15 inch channels, $2.25 per 100 pounds base; 6, 7, 8, and 10 inch channels, $2.50 per 100 pounds base; 5 inch channels, $2.75 per 100 pounds base.

Rails and Track Supplies.—Demand for track supplies and light rails is very heavy, and mills cannot guarantee deliveries on either product inside of three months. Specifications for standard sections are of the same heavy proportions as formerly. Prices are without change. We quote heavy sections, in 500 ton lots, f. o. b. mill, $28; less than 500 tons to car lots, $30; less than carload lots, $32. Light rails f. o. b. Milwaukee mill: 12 pound sections, $32; 16 pound, $31; 20 pound, $30; 25 pound, $28; 30, 35, 40 and 45 pound sections, $27.50. Track supplies f. o. b. Joliet are as follows: Angle bars, 1.50c to 1.75c; track bolts 3¼ x 3¾, with square nuts, $2.50 to $2.60 per 100 pounds; with hexagon nuts, $2.65 to $2.80.

Merchant Steel.—Efforts continue to be made by consumers to place supplementary contracts, but because of the crowded condition of mills' additional deliveries cannot be guaranteed. All producers are suffering from a congestion of specifications, and the entire output of every mill goes into immediate consumption. Prices are without change. We quote carload lots, mill shipments, Chicago delivery, as follows: Spring steel, 2.10c; sleigh shoe, flat sizes, 1.71½c; concave and convex, 1.86½c; cutter shoe, 2.35c to 2.40c; smooth finished machinery steel, 1.91½c; smooth finished tire, 1.86½c; plow steel, 2.20c and upward, according to quality; toe calk steel, 2.21c; railway spring, 1.86½c. Cold rolled shafting 50 and 2½ percent off to dealers, 50 percent off in carload lots, and 45 percent in less than carload lots. Crucible tool steel, 6½c to 8c; special grades of tool steel, 13c and up.

Cast Iron Pipe.—New business is dull. Pipe foundries, however, are operating to full capacity, consumers placing the material in storage for spring consumption. Prices are without change. We quote carload lots, f. o. b. Chicago: 4 inch water pipe, $31; 6, 8, 10 and 12 inch, $30; larger sizes, $29.50; gas pipe, $1 extra.

Merchant Pipe.—Trade in the week under review was quiet; it is not expected to pick up until after the holidays. Jobbers report their stocks low because of protracted building operations as a result of the open weather. Prices are firm and without change. We quote carload lots, f. o. b. Chicago, ¾ inch to 6 inch black steel pipe, 78.35 percent discount from list. From stock, jobbers' discounts are 76½ to 77 percent.

Boiler Tubes.—Local conditions are without material change from those reported a week ago. Demand is of good volume and prices are firm. We quote carload lots, Chicago delivery, as follows:

	Steel.	Iron.	Seamless.
1 to 1½ inches	40.35	37.35	53.00
1¾ to 2¼ inches	54.35	39.35	40.00
2½ inches	56.35	44.35	43.00
2¾ to 5 inches	62.35	51.35	
Up to 4½ inches			50.50
6 to 13 inches	52.35	37.35	

Less than carload lots from store, as follows:

	Steel.	Iron.	Seamless Steel.
1 to 1½ inches, inclusive	40	35	42½
1¾ to 2¼ inches, inclusive	50	35	35
2½ inches, inclusive	52½	35	30
2¾ to 5 inches, inclusive	60	47½	42½

Wire Products.—Jobbers in agricultural districts are pressing mills constantly for material. All sections of the country report heavy consumption and light stocks. The output of Western mills is inadequate to the demand, and producers are falling further behind in deliveries. The talk of an advance in prices early in the year is still strong, and because of the high cost of rods and billets it is expected that one will take place before February 1. We quote carload lots, to jobbers, Chicago delivery, as follows: Wire nails, $1.95; painted barb wire, $2.10; galvanized barb wire, $2.40; smooth annealed wire, $1.80; smooth galvanized barb wire, $2.10; polished staples, $2.10; galvanized staples, $2.35. Carload lots to retailers, 5 cents higher than above prices; less than carload lots, 15 cents higher are quoted.

Coke.—Coke continues irregular in price. The varying quantity which accumulates on local tracks from day to day is a bar to any established market, and until the weather changes no improvement is expected. Connellsville 72-hour grades are quoted from $3 to $3.25 at the ovens, or $5.65 to $5.90 Chicago. By-product coke is quoted at $5.90 to $6.15 Chicago.

Old Material.—The market remains quiet. Prices are growing weaker and unless heavy weather comes soon, reductions cannot be stayed. Offers have been made to buy railroad wrought at $17.25 to $17.50, but in most instances these have been declined by dealers. The production of scrap has been aided greatly by the mild weather of this month and its accumulation on local tracks has made necessary a number of forced sales to escape demurrage charges. We quote gross tons, as follows:

Old Steel Rails (4 feet and over)	$17.25 to 17.75
Old Steel Rails (less than 4 feet)	16.00 to 16.50
Old Car Wheels	19.00 to 19.50
Old Iron Rails	23.00 to 23.50
Relaying Rails, subject to inspection	26.50 to 27.00
Heavy Melting Steel	15.00 to 15.50
Mixed Country Steel	12.50 to 13.00
No. 1 R. R. Wrought	$17.75 to 18.25
No. 2 R. R. Wrought	17.25 to 17.75
Shafting	18.00 to 18.50
Dealers' Forge No. 1	14.50 to 15.00
Wrought Pipe and Flues	12.50 to 13.00
No. 1 Cast, 150 lbs. and less	14.50 to 15.00
No. 1 Mill	9.50 to 10.00
No. 1 Busheling	12.50 to 13.00
No. 2 Busheling	12.25 to 12.75
Country Sheet	8.50 to 9.00
No. 1 Boilers Cut	12.50 to 13.00
Boiler Punchings	15.00 to 15.50
Iron Car Axles	24.00 to 24.50
Steel Car Axles	20.00 to 21.00
Iron Axle Turnings	11.50 to 12.00
Cast Borings	10.00 to 10.50
Mixed Borings, etc	10.00 to 10.50
Machine Shop Turnings	11.75 to 12.25
Railroad Malleable	15.00 to 15.50
Agricultural Malleable	14.00 to 14.50
Stove Plate and Light Cast Scrap	12.00 to 12.50
Old Iron Splice Bars	20.00 to 20.50

The Milwaukee Coke & Gas Co. has made an arrangement with Pickands, Brown & Co. of Chicago, whereby this company will sell its entire output of Solvay coke on and after Jan. 1. A sales office will be opened in Milwaukee by the latter company, which will be under the management of H. J. Schlesinger and E. N. Dickson, both formerly connected with the Milwaukee firm. All correspondence referring to sales, shipments, etc. will be handled through this office, but accounts will be collected through the Chicago office of Pickands, Brown & Co. in the Rookery Building. The Milwaukee Coke & Gas Co. will retain its present sales organization under the direction of W. C. Jones as sales manager, and this company will collect all accounts on its books Jan. 1906.

Laura Lease Transferred.—The lease of the Laura iron mine at Hibbing, Mich., has been transferred by A. M. Chisholm of Duluth and his associates to Alex. W. Thompson and Wayne Wills, formerly associated with the Republic Iron & Steel Co., John C. Eden of Seattle and M. A. Hanna & Co. of Cleveland. The mine is estimated to contain at least 5,000,000 tons of ore.

CLEVELAND.

Eastern Furnaces not Yet Covered for Ore Shipments.—Specifying on Finished Materials Heavy.

OFFICE OF *The Iron Trade Review*
Browning Building, December 27

Iron Ore.—After a period of the most active buying experienced in years, purchasing of iron ore has stopped as suddenly as it began. Eastern consumers, whose requirements are only about half covered, are finding that in their tardiness in contracting they have allowed the Bessemer supply to be entirely taken up. Some ordinary and inferior grades remain, but holders are confident of sales at good prices and are in no hurry to close them out. Chartering of tonnage for 1906, which began as suddenly and was hurried through as rapidly, as ore-purchasing, has closed except in the case of the Steel Corporation which may begin late this week. Outside estimates are that it will need about 8,000,000 tonnage.

Pig Iron.—The holiday dullness is being felt this year to a less degree than usual. Inquiries are frequent and some business is being closed. An indication of the permanency of present prices is found in the sale of small lots of iron for delivery late in the first half at the full market price. Appeals are coming in greater number from foundrymen who imagined their requirements through the year and the start of 1906 well covered but who are now finding themselves running short by reason of a heavier melt than anticipated. As furnaces are being driven to capacity and yards are practically empty, no relief can be afforded the melters in the way of anticipations on 1906 contracts and many spot purchases at the top figure of quotations are resulting. Only the unbroken open weather throughout the fall and early winter, reducing the car shortage and delays in yards to the minimum, has prevented a severe iron famine. Present business, while of good proportions for the season, includes few large contracts and the impression is that, with furnace output sold to the limit, there will be a period of comparative inactivity until buying for the second half is begun, perhaps late in January, if there are continued indications of a scarcity, and perhaps not until February or March. Coke continues the easier tone which it assumed some weeks ago, with plenty of spot furnace grades selling as low as $2.85. Foundry grades are unchanged. We quote, Cleveland delivery as follows:

Bessemer	$18.35
No. 1 Foundry	18.50 to 19.00
No. 2 Foundry	18.00 to 18.35
No. 3 Foundry	17.50 to 18.00
No. 2 Southern	17.85 to 18.35
Gray Forge	16.85 to 17.35
Gray Forge, Southern	15.85 to 16.35
Lake Superior charcoal	19.00 to 19.50

Finished Materials.—Specifying throughout the week has been unusually heavy, consumers generally clearing out their expiring contracts to the limit. Some idea of how well they are covered for the next few months may be gained from the fact that mills are in most cases sold a half-year ahead. On new business there has been the usual lull incident to the holidays, and better shipments are procurable in plates and shapes, but producers insist the let-down is only a natural breathing spell and is anything but permanent. The demand and outlook in the building trade and in other lines of general commercial business are pronounced better then ever; they are keeping up the activity in finished materials, now that the enormous shipbuilding, railway and stock order requirements have been well taken care of.

Old Materials.—Little business is being transacted. Mills are buying sparingly and dealers are holding firmly for present prices. There have been few transactions on which to base quotations, which are unchanged, f. o. b. Cleveland, as follows:

Old Iron rails	$25.00 to 26.00
Old steel rails (over 6 feet)	16.75 to 17.75
Old steel rails (under 6 feet)	17.00 to 18.00
Old car wheels	17.00 to 17.50
Steel boiler plate	14.00 to 15.00
Steel axles	21.00 to 22.00
Malleable iron (railroad)	16.50 to 17.50
Malleable iron (agricultural)	15.50 to 16.50
Heavy steel	17.00 to 17.50

We quote as follows, net tons:

No. 1 R. R. wrought	17.50 to 18.00
No 1 busheling	15.00 to 15.50
No. 1 machine cast	13.75 to 14.25
Iron axles	23.00 to 24.00
Axle turnings	11.50 to 12.50
Wrought turnings (free from cast)	11.00 to 12.00
Grate bars	9.50 to 10.00
Pipes and flues	13.50 to 14.50
Tank iron	11.00 to 11.50
Hoop and band iron	8.00 to 9.00
Sheet iron	7.00 to 8.00
Wrought drillings	11.00 to 12.00
Stove plate	10.50 to 11.00
Cast borings	8.50 to 9.50

NEW YORK.

Usual Holiday Indifference.—Pig Iron Firm but Sales Few.—Railroad Business in Rail and Bridge Material Pending.

OFFICE OF *The Iron Trade Review*
ROOM 1315, No. 150 NASSAU ST., December 27

Pig Iron.—The trade is experiencing the usual holiday lull, but there is no depression; prices rule firm and everyone is ready to resume the moment festivities are over. Sales have been comparatively few but inquiries are of good volume in all grades. Besides the usual calls from pipe founders and pump manufacturers there is an inquiry for 2,000 tons of malleable Bessemer and one from the J. B. & J. M. Cornell Co. for 1,000 tons of 2.35 to 2.65 per cent silicon iron for delivery during the first four months of next year. Several round lot transactions have advanced beyond the inquiry stage but negotiations have been suspended until interest in Christmas has subsided. Pipe works have bought little during the week but they also are preparing to come in with tonnages larger than the perennial inquiries seeking a favorable price. Transactions in foundry were mainly confined to a few hundred ton lots of Virginia, Pennsylvania and New York State grades. The New York Water Supply Department is preparing to place some large contracts for pipe. Bids were received for 30,700 tons of straight pipe, 3,315 tons of special castings and 300 tons of steel castings. The specifications call for 950 feet of 6-inch straight, 25,800 feet 8-inch, 156,500 feet 12-inch weighing 1,650 pounds per 12-foot length, 47,100 feet 16-inch weighing 2,730 per length, 30,600 feet 20-inch weighing 4,065 pounds, and 35,300 feet 24-inch weighing 6,090 pounds per 12-foot length. Another contract involving 7,800 tons of pipe for which bids were received some time ago has not yet been awarded but it will probably be closed before the end of the week.

The following are prices at tidewater:

Northern No. 1 Foundry	$18.75 to 19.50
No. 2 Foundry	18.00 to 18.75
No. 2 Plain	17.50 to 18.00
No. 1 Southern Foundry	18.75
No. 2 Southern Foundry	18.25
No. 3 Southern Foundry	17.25 to 18.00
No. 4 Foundry	17.00 to 17.25

Finished Iron and Steel.—Interest in the steel trade is centered largely in the railroad business pending for rails, bridges and building material. The present negotiations cover large tonnages but whether more than a small proportion of the total will be included in the bookings of 1905 may be doubted. The new busines of the week has not been heavy. Milliken Bros. Inc. secured a contract for the erection of four steel cable towers 300 feet high for the Government of Brazil and is negotiating for orders from several other Latin-American countries. The Passaic Steel

Company has secured a 500-ton order for sugar house work on the Pacific coast and has practically completed arrangements for another of similar amount for a sugar factory in Illinois. The bar iron and nut and bolt associations reaffirmed official prices although high premiums are secured.

The following are prices at tidewater: Angles, 3 to 6 in. x ¼ in. and heavier, 1.84½c; beams, 3 to 15 in. 1.84½c; tees, 3 x ¼ in. and heavier, 1.89½c; plates, carloads, tank 1.74½c; flange, 1.84½c; marine and ordinary fire box, 1.94½c; refined iron bars, 1.84½c; soft steel bars, 1.64½c to 1.79c; sheets in carload lots New York, black, 2.40c.

Pig Iron Certificates.—Trading in pig iron certificates and warrants on the New York Produce Exchange has been somewhat more active than last week. A sale of 300 tons of the regular classification for March delivery was effected at $17 and a sale of No. 2 foundry warrants for delivery in the same month is reported at the same figure. Foundry iron warrants follow:

	Bid.	Asked.
December	16.60	17.00
January	16.70	17.00
February	16.90	17.30
March	16.80	17.30
April	16.80	17.30

Old Materials.—There has been a moderate demand for heavy steel and heavy cast scrap but wrought scrap is quiet. A sale of 1,000 tons of heavy melting steel is reported and also one of 200 tons of cast scrap. The following are prices at tidewater approximately:

Old iron rails	$21.00 to 22.00
Old steel rails, long lengths	15.50 to 16.00
Old steel rails, short pieces	15.00 to 15.50
Relaying rails	23.00 to 24.00
Old car wheels	16.00 to 16.50
Old iron car axles	24.00 to 25.00
Old steel car axles	19.00 to 19.50
Heavy melting steel scrap	15.50 to 16.00
No. 1 railroad wrought scrap	20.00 to 21.00
Iron track scrap	18.50 to 19.50
Wrought pipe	14.00 to 15.00
Cast borings	10.00 to 10.25
Wrought turnings	14.50 to 15.50

PHILADELPHIA.

Continued Strong Demand For Basic Iron is Feature of a Quiet Week.

Pig Iron.—The most notable feature of an unusually quiet week, quite in keeping with the holiday season, is the strong demand for basic iron. Despite the large sales reported to Eastern mills recently inquiries for basic continue active, and the scarcity of this grade is probably more marked than in any other kind. With a natural resumption in trade activity after the Christmas season the price, which holds firmly at $18 to $18.25 per ton, is expected to advance. The arrival of two or three cargoes of English low phosphorus has helped to ease up a trifle the demand in that line, where the supply is always rather limited. Many users of foundry iron are seeking to anticipate shipments, but furnace men are not disposed to accede to their wishes in this matter. Prices continue very firm in spite of the general quietude of the market. and no concession to buyers is thought of. Quotations show no change from last week, as follows:

No 1X Foundry	$19.00 to 19.25
No. 2X Foundry	18.50 to 18.75
No. 2 Plain	18.00 to 18.25
Standard Gray Forge	16.50 to 17.00
Basic	18.00 to 18.25
Low Phosphorus	24.00 to 24.50
Southern No. 2X, rail	18.50 to 18.75

Finished Material.—It is the old story of a steady rush of work, with buyers so insistent in their orders that all holiday recreation will be cut down to the lowest point possible. Bar iron continues very active, and prices remain as already quoted: Beams, channels and angles according to specifications, 1.82½c to 2.50c; refined iron bars, 1.75c to 1.85c; steel bars, 1.63½c to 1.83c; plates, 1.73½ to 1.83½c.

Old Material.—Comparatively few sales have been reported during the past week, and the tone of the market is so quiet that activity could only be stimulated by cuts in prices. Dealers are not inclined to do this, and as the mills seem to be pretty well supplied with scrap prices stand just where they did a week ago, as follows:

Old steel rails	$18.25 to 18.50
No. 1 steel scrap	18.00 to 18.50
Old steel axles	21.50 to 2 .00
Old iron axles	28.00 to 28.50
Old iron rails	23.00 to 24.00
Old car wheels	17.50 to 18.00
Choice scrap, R. R. No. 1 wrought	22.50 to 23.00
No. 1 yard scrap	20.00 to 21.00
Machinery scrap	16.50 to 17.00
Low phosphorus scrap	22.00 to 23.00
Wrought iron pipe	16.50 to 17.00
No. 1 forge fire scrap	16 50 to 17.00
No. 2 forge fire scrap, ordinary	13.25 to 13 50
Wrought turnings	14.50 to 15.00
Axle turnings, heavy	15 50 to 16.00
Cast borings	10.50 to 11.25
Stove plates	13 25 to 13.75

BIRMINGHAM.

Some Sales of Pig Iron.—Year Closes with Good Feeling on All Sides.

Birmingham, Ala., Dec. 26, 1905.—The last week of the year saw some sales made of iron which will require several weeks' make to fill. The make of the first half of the coming year has been well covered. The production has not been cut down much on account of the holidays, though labor has been unsteady during the last four or five days. The steel plant, rolling mills, cast iron pipe plant and other industries using pig iron in their daily operation have been quiet though intentions are to resume operations before the end of the week with one day lay off for the new year. There are orders on hand at almost all the institutions for a large quantity of iron and there are no reasons why the first half of the coming year should not be a prosperous one. It is stated that the Republic Iron & Steel Co. will start up the old puddling department of the rolling mills in Birmingham after the turn of the new year, the order books for finished iron and steel being well filled.

No. 2 foundry iron is still selling at $14.50 per ton with indications of an advance in the near future. The prospects are quite bright as the year comes to a close. There are indications of a need for a large quantity of iron. Shipments are heavy and in all directions.

The production in Alabama will be improved some during the coming month. The output of the furnaces for the year just closing will show an increase as compared to the production of last year of about ten percent. The furnaces have done nicely, considering everything, several obstacles having been met, shortage of coke being among the most prominent. There will hardly be any shortage of raw material other than coke during the winter, preparations having been made at the ore mines, coal mines, limestone quarries, etc., for a full supply.

The year will close with good feeling prevailing on all sides.

CINCINNATI.

Heavy Demand For Finished Materials Will Figure Strongly In Iron Market.

Pig Iron.—The week under review presents nothing of striking contrast with the few weeks just preceding. The advent of the holidays, with traveling men at home and the general interruption of routine incident to this time of year, has no doubt contributed in part to the quietude which has prevailed in the pig iron market. We hear of but few transactions and the inquiry pending is insignificant. It is reported that one of the leading tube makers has

purchased 3,000 tons of gray forge for first quarter delivery at $13.00 Birmingham. A sale of foundry iron amounting to 500 tons, for first half delivery, in Cleveland territory at $14.50 for No. 2 foundry Birmingham was given out, and a sale of 2,500 tons of malleable Bessemer to a Michigan consumer at $17.25 valley furnace comprise the only transactions. No one expects to see any important change in the market until after the first of the year.

One of the important factors in the situation will be the demand for finished material. A number of consumers have indicated their willingness to cover their wants in the first half of the new year as soon as they can feel assured that their product will be wanted. A notable instance of this is the recent covering of a bar mill, which has sold its output well forward, and has bought pig iron and scrap to cover its sales of bars. Other melters of pig iron are inclined to adopt this same policy. It is argued that the price of pig iron is too high now to make its purchase a safe speculative investment, on the other hand the situation is strong enough on the producer's side to justify purchases to cover finished product sold ahead. All information at hand indicates that the developments brought to light during January will be likely to furnish significant evidence of the trend of the market. At present there is nothing in the situation, from either side of the market, to indicate what may be disclosed under the progress of the condition in the pig iron trade. Consumption and production are both large; buyers are covered to some extent during the first half of the year, how much more iron they will require is problematical; sellers have a good tonnage booked ahead—how nearly their product is contracted for is not clear. The situation is sensitive because of the unusual element of doubt as to the future supply and demand conditions, and the relatively high position of prices. Southern iron is still obtainable at $14.00 Birmingham with some furnaces asking $14.50; Northern iron is quoted at $17.50 to $18.00 at southern Ohio furnaces.

Southern Foundry No. 1	$17.25 to 17.75
Southern Foundry No. 2	16.75 to 17.25
Southern Foundry No. 3	16.25 to 16.75
Southern Foundry No. 4	15.75 to 16.25
Southern Foundry No. 1, soft	17.25 to 17.75
Southern Foundry No. 2, soft	16.75 to 17.25
Gray Forge	15.75 to 16.00
Northern Foundry No. 1	19.15 to 19.65
Northern Foundry No. 2	18.65 to 19.15
Northern Foundry No. 3	18.15 to 18.65
Jackson County Silvery, 8 percent	20.15 to 20.65
Southern Charcoal	19.75 to 20.25

Coke.—There is not much trading and prices are slightly easier. Quotations from the leading coke producing districts are as follows:

†Wise County, Va. Furnace Coke prompt shipment.	$ 3.00 to 3.25 per ton
Wise County, Va. Foundry Coke prompt shipment.	3.50 to 3.75 per ton
Pocahontas Furnace Coke on contracts	
Pocahontas Foundry Coke on contracts	
Connellsville Furnace Coke prompt shipment	2.85 to 3.00 per ton
Connellsville Foundry Coke prompt shipment	3.75 per ton
New River Foundry Coke on contracts or prompt shipment.	3.50 to 3.75 per ton
New River Furnace Coke, prompt shipment	2.75 to 3.00 per ton

†Wise County, Va., Coke on Furnace contracts is sold mainly on a sliding scale basis for pig iron prices on the following basis: $1.65 per ton on $9.00 pig iron, plus 17 percent of the advance on pig iron above $9.00 Birmingham.

Finished Material.—There is more activity in bar iron, and this product is receiving considerable attention. Quotations are irregular but the tendency is upward. Western markets are below the Youngstown basis, but mills are marking up their prices. Prices range from 1.80c to 1.90c for car load lots f. o. b. Cincinnati. Demand continues active for all descriptions and jobbers are having a good trade in small lots. Structural is just as difficult to obtain as it has been in the recent past.

Bar iron is quoted at 1.80c to 1.90c; steel bars at 1.63c half extras with dealers quoting 1.85c for iron and steel out of store. Galvanized sheets No. 10 and No. 12, in car lots are 2.48c. We quote black sheets No. 27 at 2.30c in car lots of 500 bundles. Black sheets out of store are selling as follows: No. 28, 2.75c; No. 27, 2.65c.; No. 16, 2.25c; No. 14, 2.15c; No. 12, 2.05c. Tank plates are firm and sell out of store at 2c for ¼-inch and 2.10c for 3-16, Nos. 8 and 10. Beams and channels are quoted at 2.25c to 2.50c from stock and angles at 2c to 2.05c for base sizes.

In merchant pipe there is no particular change to note, but prices are hardening and the schedule of the leading interest is well maintained. We quote f. o. b. Cincinnati:

MERCHANT PIPE.
(Basing Discounts.)

	Steel Pipe. Black. Percent.	Steel Pipe. Galv. Percent.	Guaranteed Wrought Iron Pipe. Black. Percent.	Guaranteed Wrought Iron Pipe. Galv. Percent.
⅛ and ¼ inches	69.7	53.7	67.2	51.2
⅜ and ½ inches	73.7	61.7	71.2	59.2
¾ to 6 inches	77.7	67.7	75.7	65.7
7 to 12 inches	72.7	57.7	70.7	55.2

Old Material.—The market continues firm at quotations, but is not especially active. We quote f. o. b. Cincinnati:

Old No. 1 railroad wrought, net tons	$17.50 to 18.00
Cast machine and foundry, net tons	14.00 to 14.50
Old iron rails, gross tons	24.00 to 25.00
Old steel rails, gross tons	16.50 to 17.00
Old short lengths, gross tons	17.50 to 18.00
Old iron axles, net tons	23.50 to 24.00
Stove plate, net tons	10.50 to 11.00
Wrought turnings, net tons	11.00 to 12.00
Cast borings, net tons	9.00 to 9.50
Car wheels, net tons	16.50 to 17.00

The Metal Market.

CHICAGO.

OFFICE OF *The Iron Trade Review*,
1164 MONADNOCK BUILDING, December 27.

The demand for metals has not been of as active a nature as in the weeks preceding Christmas. The holiday season and the excessively high prices that are asked for copper, pig lead and pig tin have each acted in curtailing trade. Buyers are covering only for immediate wants in the expectation that prices will drop in the near future. Instead, however, they continue to advance, copper and pig lead selling at higher prices than ever before in the history of the trade. We have revised our quotations and quote lake copper in carload lots, 21½c to 22c, and in smaller lots, 22c to 22½c. Casting copper is practically unobtainable and is now quoted on the same basis as lake. Pig lead is extremely scarce and carload lots are offered at 6.10c to 6.35c, with further advances daily expected. Pig tin is without change at 38c to 40c, according to quantity. Spelter is strong at 6¾c for carload lots, and 7½c to 8c for smaller quantities. Antimony, 13½c to 15c for Hallett's, and 14½c to 15c for Cookson's. Nickel is 50 to 60c, according to amount and deliveries.

Old metals are moving upward in sympathy with the new product. The market is strong and demand brisk. Approximate quotations of local dealers are as follows: Copper wire, 16c to 16.25c; copper heavy, 16c; light copper, 14.50c; red brass 14.75c; red brass borings, 12.25c; tea lead, 4.75c; zinc, 5c; pewter, 23½c.

Ore Tonnage Through Canals.—The ore tonnage passing through the canals at Sault Ste. Marie during the season of 1905 was 31,332,637, against 19,635,797 in 1904, an increase of 60 percent. Considerable increases were recorded in almost all other articles of commerce, only silver ore and building stone decreasing to any extent. The United States Canal was open from April 14 to Dec. 16, a season of 246 days; the Canadian canal opened four days earlier and closed four days later.

Earnings of the Republic Iron & Steel Co., are said to be running near $4,000,000 a year at the present, considerably more than at any former time in the company's history.

SLIGHT INCREASE

Of Ore on Docks Compared with Heavy Receipts at Lake Erie Ports for 1905 Season.

Owing to the fact that one dock has not reported, it is not yet possible to give in detail the statistics of Lake Erie ore receipts for the season of 1905 and the ore on docks Dec. 1, but the statistics from docks reporting, which will probably not vary more than 15,000 tons from the accurate total, indicate that the receipts were 29,012,754 tons against 17,932,814 in 1904, and that the ore on docks Dec. 1 was 6,746,410 tons against 5,763,399 tons Dec. 1, 1904. The amount of ore on dock is therefore only about 1,000,000 tons more than it was a year ago, although the receipts at Lake Erie ports have increased more than 11,000,000 tons.

NEW ENGLAND FOUNDRYMEN'S ASSOCIATION.

At the regular monthly meeting of the New England Foundrymen's Association, held at the Exchange Club, Boston, Dec. 13, officers were nominated to be balloted upon at the annual meeting. President John Magee declined to serve again and the following list was chosen; president, W. B. Snow of the B. F. Sturtevant Co.; vice president, Wm. H. Bense of the Kingsley Iron & Machine Co.; secretary, Fred F. Stockwell of the Barbour-Stockwell Co.; treasurer, George H. Lincoln of George H. Lincoln & Co. For the executive committee of five these nominations were made; Henry F. Arnold, American Tool & Machine Co.; Henry A. Carpenter, A. Carpenter & Sons Fdy. Co.; Chas. J. Caley, Russell & Erwin Mfg. Co.; Arthur Gibby, Mechanics Iron Foundry; A. J. Miller, Whitehead Bros.; Henry Souther, Souther Engineering Co.; H. E. Wetherbee, Jas. Hunter Machine Co.

Arrangements for the January meeting, which will combine the features of the annual meeting and tenth anniversary, were left in the hands of a committee composed of the present and past presidents of the association with H. A. Carpenter as chairman. The Union Mfg. Co., New Britain, Conn., was elected to membership. After the business meeting, Dr. Richard Moldenke, sec'y of the American Foundrymens' Association, Watchung, N. J., read an interesting paper on "Tendencies in the Foundry Industry." It was followed by a brief discussion.

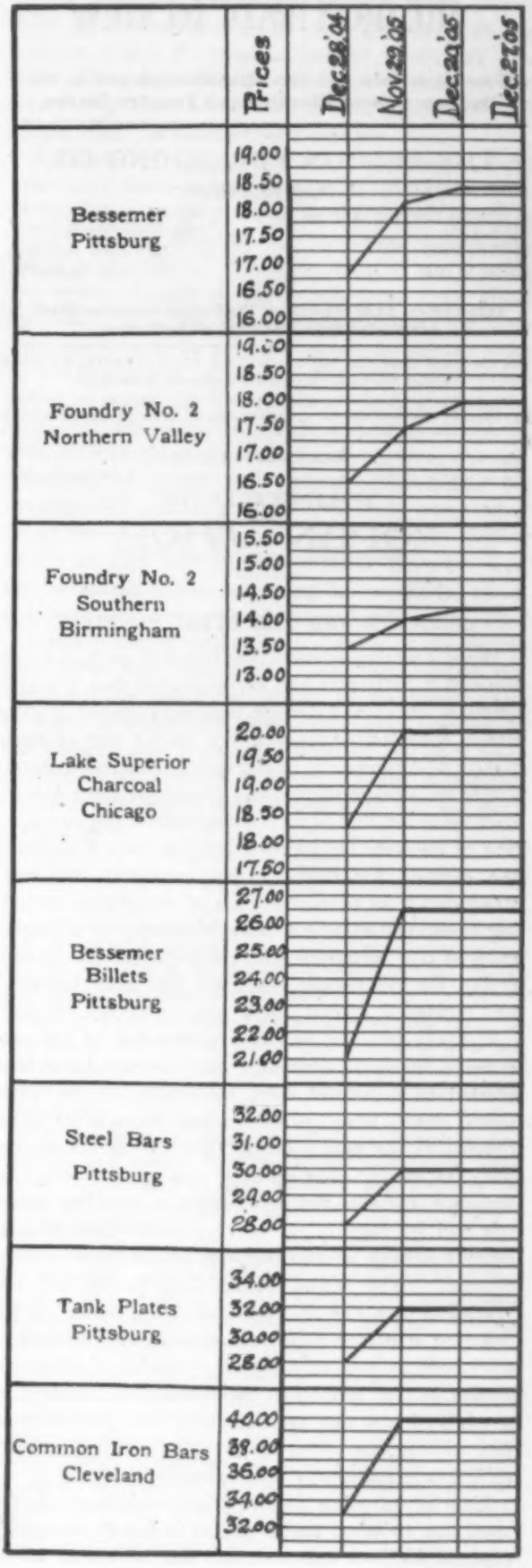
ADDITION TO FURNACE CAPACITY.

James M. Swank, in the forthcoming issue of the Bulletin of the American Iron & Steel Association, estimmates that 29 stacks either long idle or entirely new, "with a total annual capacity of 2,253,500 tons, are likely to be blown in between Jan. 1, 1906, and the fall of that year, and that of this total 19 stacks, with an annual capacity of 1,995,000 tons, will use coke for fuel, 2 stacks with an annual capacity of 110,000 tons will use anthracite coal and coke mixed, one stack with an annual capacity of 36,000 tons will use anthracite coal alone and seven stacks with an annual capacity of 112,500 tons, will use charcoal."

By months the number and capacity of the stacks to be blown in are as follows: January, six long idle and three new stacks, 510,500 tons; February, one long idle and two new furnaces, 258,000 tons; March, two new and one long idle stacks, 220,000 tons; April, one new and one long idle stack, 150,000 tons; May, four long idle stacks, 200,000 tons; June, three new stacks, 450,000 tons; July and early fall, five new stacks, 465,000 tons.

The Otis Elevator Co. has purchased a tract of land in the Kensington section of Buffalo, N. Y., lying between East Delavan avenue and Ferry street. It is reported that the land will be used as a site for a large plant. It is said that negotiations are also on foot with a view to the purchase of the Howard Iron Works.

PRICE CHART.



THE IRON TRADE REVIEW

Devoted to Iron and Steel Manufacture and to the Machinery, Metal-Working and Foundry Trades.

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CONCRETE AND THE STEEL BUSINESS.

When concrete construction was first proposed and through experiments had demonstrated that it was a practical, cheap and durable building material, it gave rise to considerable apprehension on the part of steelmakers who foresaw in its increasing use a possible substitute for steel-construction. They have since discovered, however, that to a very large extent the introduction of concrete has increased rather than diminished the demand for steel. It has permitted the construction of an extensive class of structures, including mills, factories and office buildings, at a largely reduced cost compared with old methods, and in supplying the reinforcing materials for these buildings has created a market for a heavy tonnage of steel.

If every building recently constructed of concrete could with equal advantage and expense have been erected of structural steel, the maker of the latter would clearly have sustained a loss through the introduction of the new process. But this is not stating the case fairly. The reduced cost of concrete construction, the ease and promptness in securing materials and its rapidity in working have made possible many buildings which otherwise would not have been erected. The record of building in the last few years has been one of unprecedented growth. Every concrete structure requires a considerable amount of steel bars as well as a goodly quantity of structural shapes. To this must be added the tremendous amount of iron and steel entering into the construction of concrete plants all over the country and into their heavy machinery and equipment.

Exactly to what extent concrete has supplanted steel and to what extent it has indirectly created a demand for iron and steel can not of course be determined. But the continued advance of the iron and steel business in connection with the giant strides in the building world offers ample evidence that the steelmaker has not suffered. Rather it is that as steel reinforcement has made concrete construction possible and practical the growing use of concrete has rebounded to the advantage of steel in even greater degree.

ORE SHIPMENTS NOT TOO LARGE.

The fact that shipments of Lake Superior ore this season exceed 34,000,000 gross tons, or 12,000,000 tons more than the shipments of 1904 and 6,500,000 tons more than the record shipments of 1902, is ground for surprise. So also are the facts that pig iron production this year will be 23,000,000 tons and that the present production is at the rate of 25,000,000 tons per year, when the best calendar year's production heretofore has been 18,009,252 tons, in 1903, and the best consecutive twelve months' record has been but a trifle over 19,000,000 tons, in the twelve months ended with September, 1903.

The startling gains thus made give reason for an enquiry as to whether these gains are coherent, or represent a disorganized rush into dangerous territory. It is not unfitting, when the general subject is taken up, that a glance should be had at the relation which Lake Superior ores have been showing of late years to the total iron ore production of the country. Accordingly, the appended tables are presented.

The first table shows the pig iron production of the country from 1889 to the present, together with the country's production of iron ore, the production of the Lake Superior region, and the shipments from the region. The year 1889 is taken as the starting point because this is the first of the consecutive years for which the total iron ore production of the country has been ascertained. Both production and shipments of the Lake Superior region are given, as they vary from each other from year to year. The totals of each for the whole 16 years are less than 3,000,000 tons apart, representing natural increases in stocks at mines.

IRON ORE AND PIG IRON PRODUCTION, GROSS TONS.

	Total Production:		Lake Superior Region:	
	Pig Iron.	Iron Ore.	Production.	Shipments.
1889	7,603,642	14,518,041	7,519,614	7,292,643
1890	9,202,703	16,036,043	8,944,031	9,003,725
1891	8,279,870	14,591,178	7,621,465	7,071,053
1892	9,157,000	16,296,666	9,564,388	9,072,241
1893	7,124,502	11,587,629	6,594,620	6,065,716
1894	6,657,388	11,879,679	7,682,548	7,748,312
1895	9,446,308	15,957,614	10,268,978	10,429,037
1896	8,623,127	16,005,449	10,566,359	9,934,828
1897	9,652,680	17,518,046	12,205,522	12,464,574
1898	11,773,934	19,433,716	13,779,308	14,024,673
1899	13,620,703	24,683,173	17,802,955	18,251,804
1900	13,789,242	27,553,161	20,564,238	19,059,393
1901	15,878,354	28,887,479	21,445,903	20,593,537
1902	17,821,307	35,554,135	26,977,404	27,571,121
1903	18,009,252	35,019,308	26,573,271	24,289,878
1904	16,497,033	27,644,330	20,198,311	21,822,839
1905	23,000,000*			34,000,000*

*Estimated.

For the sake of conciseness, as well as to eliminate as far as possible the influence of stocks of iron ore at

various points, the total time from 1889 to 1904 has been divided into four quadrennial periods, and for each of these is shown the average number of tons of iron ore produced in the whole country, produced in the Lake Superior region, and shipped from that region, per 1,000 tons of pig iron produced in the quadrennial period, as follows:

TONS OF IRON ORE PER 1,000 TONS OF PIG IRON PRODUCED, AVERAGING QUADRENNIAL PERIODS:

	Total Production:	Lake Superior Region: Production	Shipments
1889-1892	1,794	983	947
1893-1896	1,740	1,102	1,073
1897-1900	1,827	1,318	1,337
1901-1904	1,864	1,396	1,382

No account is taken in the above table of imports and exports of iron ore. The exports are immaterial to such a comparison, and the imports nearly so, inasmuch as in the first period they represented only about 30 tons per 1,000 tons of pig iron, in the next two about 15 tons, in the last only about 50 tons.

It will be observed that the total iron ore production of the country, relative to pig iron, showed a slight decrease in the second period, and a moderate increase in the next two. Had the consumption of imported ore been taken into account, it would be seen that in the first period there were used approximately 1,800 tons of iron ore for every 1,000 tons of pig iron produced, and in the last period about 1,900 tons. The increase over the whole period is due to the leaner character of the ores which must now be used. The second quadrennial period, 1893 to 1896, showed a decrease, which was due to the increasing influence of the rich Lake Superior ores. Later, leaner ores from this region have had to be used.

The ascendance of the Lake Superior region is well shown. While during the 16 years the production of pig iron by the country more than doubled, the shipments of the Lake Superior region not only kept pace with this, but increased in a much greater ratio, being 947 tons per 1,000 tons of the country's pig iron production in 1889-1892, and 1,382 tons in 1901-1904. These shipments were 52.8 percent of the country's total iron ore production in the earlier period, and 74.2 percent in the later period. The amount of pig iron made from them is in still greater ratio; they are richer in iron than the average of all other ores mined.

With this history presented, the natural enquiry is as to the relation which the present year's shipments of Lake Superior ores sustains to the present and prospective production of pig iron. In the four years 1901 to 1904 the Lake Superior region shipped 1,382 tons of iron ore for every 1,000 tons of pig iron which the country produced. At this rate, shipments of 34,000,000 tons would call for a production of 24,600,000 tons. The pig iron production of 1905 will be about 23,000,000 tons, while the present rate of production is 25,000,000 tons, and from now until next midsummer, when next season's ores may be used, production is likely to be at a greater, rather than a less rate. The present year's shipments, therefore, have been less, rather than greater, than the tonnage which the present demand would call for. Even the rate which prevails as far back as the years 1897-1900 would call for but 25,400,000 tons of pig iron.

Estimates of Lake Superior ore shipments next year vary from 34,000,000 tons to 38,000,000 tons. If the latter should prove to be the correct figure, it would, on the basis of the 1901-1904 record, call for a production of 27,500,000 tons of pig iron in the twelve months during which those ores would be used. It is far from impossible that the blast furnaces then to be available would be able to make as much pig iron as this, or that sufficient demand could be found for the product. It is more to be supposed, however, that such shipments could be utilized, with a lesser production of pig iron, through influences which are well understood, including the invasion of consuming territory hitherto using other ores, through the gradual but inevitable decline in the average iron content of Lake Superior ores, the increasing stocks, both inert and available, which it is necessary to carry on docks and at furnaces, etc.

Nothing can be clearer from a study of the figures here given than that there is not the slightest unsoundness, or cause for alarm, in the great spurt in Lake Superior ore shipments, when referred to the present and prospective rate of pig iron production of the country at large. If this is realized, the labor involved in their presentation will not have been in vain.

PERSONAL.

Joel Bernice Ettinger has been appointed western manager of the S. A. Woods Machine Co., Boston, Mass., to take the place of R. B. Dunsmore, resigned. Mr. Dunsmore intends to enter another field.

Frank S. Todd, for several years identified with the J. G. Brill Co. of Philadelphia, has become connected with the International Railway Co. of Buffalo to assume complete charge of the car-building plant which it is erecting at Cold Springs.

A. B. Jennings has accepted a position as second vice president and general manager of the Jacksonville Iron Works, Hazleton, Pa. Mr. Jennings was formerly in charge of the mining pump department of the International Steam Pump Co.

Harry Bonnell, who has resigned the position he has held for some years in the shafting department of the Republic Iron & Steel Co. at Youngstown, denies the newspaper reports that he is to enter the steel shafting business on his own account.

H. F. Devens, who has been puchasing agent of the National Cash Register Co. at Dayton, O., on Jan. 1 assumes the duties of general purchasing agent with headquarters at Rooms 1020-2 American Surety Bldg., New York. Clifford R. Gardinor, at present assistant purchasing agent, succeeds Mr. Devens as purchasing agent at Dayton. The New York Agency was established because of the fact that a large percent of purchases are made from eastern houses.

JOHN A. TOPPING TENDERS HIS RESIGNATION

AND WILL RETIRE FROM PRESIDENCY OF AMERICAN SHEET AND TIN PLATE CO.

Rumored That He Will Assume Important Position in Connection With Two Great Companies.

(Special Telegram from Staff Correspondent.)

New York, Dec. 27.—Following the announcement of last week that Republic Iron & Steel Co. interests had obtained control of the Tennessee Coal, Iron & Railroad Co., and also the news of this week that J. A. Topping will retire from the presidency of the American Sheet & Tin Plate Co., it is persistently rumored that Mr. Topping will soon assume

JOHN A. TOPPING.

a position of much importance in connection with the two companies. These rumors, although not officially confirmed, are generally credited in iron and steel circles, and Mr. Topping's friends are manifestly much pleased in regard to his prospects. It is understood that the details of the new plan have not been worked out, but it is expected that the Republic Iron & Steel Co. and the Tennessee Coal, Iron & Railroad Co. will be very closely affiliated.

Mr. Topping's Resignation.

Pittsburg, Dec. 27.—The resignation of Mr. John A. Topping, president of the American Sheet & Tin Plate Co., one of the constituent companies of the United States Steel Corporation, has been announced and will take effect Jan. 1. While Mr. Topping will say nothing as to his plans further ahead than severing his connection with the American Sheet & Tin Plate Co., it is currently reported he will soon become president of the Republic Iron & Steel Co., which will move its headquarters from Chicago to Pittsburg, April 1.

When interviewed respecting the many rumors concerning his future plans, Mr. Topping said: "To set at rest current rumors, I will state that I have resigned the presidency of the American Sheet & Tin Plate Co., effective Jan. 1, 1906, in order that I may assume other business obligations. This statement I regret to make inasmuch as it means the severance of personal and business relations that to me have been most pleasant both in respect to my associations within this company and also my connection with the officials of the United States Steel Corporation.

"As to my future plans, it would be premature to make any statement at this time, and it would also be highly improper for me to make any statement as to who will be my successor. As a result of my resignation a reorganization of the officials of the company will, of course, be necessary and at a later date the proper authorities will doubtless announce the reorganized list of officials. That there will be 'many and important changes in the organization' as rumor has it, is highly improbable, as the company has an efficient organization and one entirely capable of maintaining its present business standing."

It is currently reported that Mr. C. W. Bray, first vice president of the American Sheet & Tin Plate Co., will succeed Mr. Topping as president, but it cannot be confirmed.

C. W. BRAY.

Mr. Topping, through the various industries with which he has been connected and on account of the variety of products manufactured by companies with which he has been associated has a very broad knowledge of the iron and steel business, his various operations putting him in touch with the manufacture of pig iron, steel, billets and the higher finished forms, such as merchant bars, plates, angles, shapes, pipe, nails, sheets and tin plate, this experience having carried him over a broader field than it is the fortune of the average man to acquire. Mr. Topping went into the iron

and steel business as clerk for the old Etna Iron & Steel Co. and was in the continuous employ of that firm and its successor, the Etna Standard Iron & Steel Co., until 1900. In 1898 he was elected president of the company and in the spring of 1900, when the Etna Standard Iron & Steel Co., merged its sheet steel interests with the American Sheet Steel Co., Mr. Topping was elected first vice president of the American Sheet Steel Co. and continued in that capacity until 1903 at which time he was offered and accepted the president of the LaBelle Iron Works, at Steubenville, O. In July, 1904, Mr. Topping left the LaBelle organization to accept the presidency of the American Sheet & Tin Plate Co.

Mr. C. W. Bray, who is mentioned as Mr. Topping's successor as president of the American Sheet & Tin Plate Co., was born in Pittsburg, Feb. 15, 1864 and was educated in the Pittsburg public and high schools. In 1882, at the age of 18 years, he entered the employ of the Lewis Foundry & Machine Co., Pittsburg, as draftsman and remained there until 1888, when he became secretary and chief engineer of the Lloyd Booth Co., Youngstown, O. In 1894, Mr. Bray organized the Beaver Tin Plate Co., of Lisbon, O., and was elected president. When this company was absorbed by the American Tin Plate Co., he became chief engineer of the latter concern and for the past two and one half years he has been vice president of the American Sheet & Tin Plate Co.

WANT COKING COAL ADMITTED FREE.

(Special Correspondence.)

Toronto, Can., Dec. 26.—At the sitting of the Dominion Tariff Commission held at Sault Ste. Marie on the 21st, F. H. Clergue and General Manager Sawyer, representing the Lake Superior Corporation, urged the removal of the duty on soft coal used for coking purposes. They stated that the directors had authorized the construction of open-hearth furnaces for the manufacture of steel. Open-hearth furnaces could use ore from the Helen mine, which cannot be used in the Bessemer plant. They will also build their own coke plant and produce coke on the Canadian side, if the coal duty is removed. If not, they will make the coke on the Michigan side as it can be brought in duty free while the import duty on coal is 53c per ton. The establishment of the coke industry would involve the employment of 300 men.

Southern Steel Extensions.—The Southern Steel Co., Gadsden, Ala., states that its plans for the immediate future include the doubling of its steel plant, additions to the bin capacity of its furnaces, the increasing of its soaking pit capacity and the building and equipping of an entirely new modern rolling mill. It will also erect two additional finishing mills, the exact character of which it is not ready to announce. When these extensions have been gotten well under way plans for further extensions will be put into effect.

Bessemer Association Continued.—Members of the Bessemer Pig Iron Association, at a recent meeting decided to continue the association for another year, or until Jan. 1, 1907, with the same executive committee as served last year. This committee consists of Samuel Mather, treasurer; Harvey H. Brown, Edward L. Ford, Robert Bentley, Frank Hitchcock, L. C. Hanna and J. G. Butler Jr., president.

H. H. Baxter, for the last three years engaged in organizing and managing the publicity department of the Westinghouse Electric & Mfg. Co., has established an advertising agency catering particularly to the mechanical field. The new agency, which is located in the Park building, Pittsburg, has already been very successful, having secured the account of the Mesta Machine Co. and a quantity of smaller business.

OBITUARIES.

Edward B. Lathrop, for the past four years treasurer of the Locomotive Appliance Co., Chicago, died suddenly of heart disease Dec. 20 at his apartments in the Hotel Windermere. He was 60 years old.

Thomas Henderson, for 30 years manager of Schoenberger's Mill at Pittsburg and later connected with the Pittsburg Forge & Iron Co. in the same capacity, died recently at the age of 73. He had been a resident of Pittsburg for more than half a century.

William G. Whiteley, manager of the mills of the McCullough Iron Co., Wilmington, Del., and a brother of Henry Whiteley, president of the company, died Dec. 14, aged 51 years. Mr. Whiteley has acted as general manager for the past ten years.

Luther Fillmore, a pioneer in railroading in the United States, died Dec. 18, aged 79. At the age of 21 he built the Syracuse & Binghamton Railroad and in 1848 rebuilt the Erie road. He was also for a time superintendent of the South Pacific Coast road.

Israel Morris, at one time a leading figure in the iron trade of Philadelphia, died on Dec. 13, at his Arch street home. He was 95 years old and was the founder of the once-famous firm of Morris & Wheeler. He had been retired from active business since 1860.

George M. McKelvey, a merchant and capitalist of Youngstown, O., committed suicide Dec. 24; continued ill health was the cause. He was vice president of the Youngstown Iron & Steel Roofing Co., and was heavily interested in the Youngstown Sheet & Tube Co. as well as other local enterprises.

Andrew Gray Wilson, general superintendent of the marine department of the Maryland Steel Co., at Sparrows Point, Md., died Dec. 22 of heart failure at his home in Wilmington, Del. He went to Sparrows Point about seven years ago after a connection of 36 years with the Harlan & Hollingworth Ship Building Co. He was 61 years of age.

George Deming, vice president of the George Worthington Hardware Co., Cleveland, died Dec. 24 at his estate at Davis Island, N. C., where he had gone to spend the winter after suffering an attack of heart failure. He was 76 years old and had been associated with the Worthington Co. for 61 years. At one time he was president of the National Hardware Dealers' Association.

Herman Haupt, a prominent civil engineer and a veteran of the Civil War died from heart disease on a Pennsylvania Railroad train Dec. 14, aged 88 years. Gen. Haupt was the oldest graduate of the West Point Military Academy; he was general superintendent of the Pennsylvania Railroad from 1849 to 1852; and later he became chief engineer of the Pennsylvania Transportation Co., general manager of the Northern Pacific and president of the Dakota & Great Southern Railroad.

J. H. Vogel, chief engineer of the Birmingham & Atlantic Railroad, died at Birmingham, Dec. 19, a few days after undergoing an operation. Born at Greiz, Germany in 1868, he studied at Geneva and the Polytechnichum at Zuerich, from which latter institution he received the degrees of Mechanical and Electrical Engineer. He went to Niagara Falls with the famous Swiss hydraulic engineer, Mr. Turretini, whom he assisted in the erection of the power plant there. Later on he was engineer with the Westinghouse Electric Co., and several other concerns in this country and abroad. Quite a number of years he then spent in Mexico, doing general consulting work, returning some years ago to become chief engineer of the Birmingham & Atlantic. He was a brother of Felix A. Vogel.

THE YEAR 1905 ON THE IRON ORE RANGES.

Aside from the mere size of the season's shipments, the most startling facts of the year's business on the Lake Superior iron region have been the troubles Mesabi range mines have undergone during much of the year with water, and the freedom with which shipments have continued despite this and the scarcity of men.

The shipments of the year have exceeded those of any previous season by 79 percent, and have reached the tremendous volume of 34,000,000 gross tons.

Early this year there were slight labor troubles on the Mesabi range, but they were quieted by the firm hand of those in charge of the business, and since April nothing has occurred to disturb harmonious relations between men and employers. Wages have been advanced voluntarily when it was considered justifiable and while there have not at any time been as many men as the mining interests would have been glad to see, there have been enough to carry forward the operations of mining and stripping, as well as to perform the enormous additional and unusual labor required by the traffic of the year. If it had not been for the increase this year in the proportion of open-pit mining, it is not probable there would have been men enough. This increase of steam shovel mining is going on rapidly, and the proportionate steam shovel shipments from the Mesabi range next year will be more than in any past season. For 1905 the percentage of Mesabi ore taken out by steam shovel from open cut mines—not including the milling operations—has been about 55 percent. This is an increase of about 5 percent over last year. In addition to this the percentage of milled ore has increased this year to such a point that all but about 35 percent of the product of the range is mined open pit, either by steam shovels or milling. With a still greater increase of steam shovel mining the coming year, it will probably take no more men to handle the business of the year, than for that of 1905.

It was not long after the beginning of the shipping season before it was evident that ore prices fixed in the winter were sure to rise. All summer they were at a premium and the advance of 50 cents a ton recently made on the business of the coming season is merely stating officially what has been the fact for a longer or shorter period. The price for ore is now $1 a ton higher than at the beginning of 1904, and is at a point where the miner is sure of an excellent return on his investment and for his labor. It is sure that shipments for 1906 will be far in excess of those for 1905, though the rate of progression, which this year reached a 63 percent increase. THE IRON TRADE REVIEW has placed an estimate of 38 to 39 millions as the possible business for 1906, but mining men generally do not think it likely that so much can be forwarded. The bulk of any increase must be from the Mesabi range, it is well known that the others are well up to their limits. Indeed the Vermillion shows an increase of but 15 tons over its business of 1903. This range will probably add somewhat to its tonnage the coming year, but one of its chief shippers, the Chandler, is nearing its end with speed and can be an item for but a very brief period. The life of this mine is more accurately determinable than is that of most properties, its reserves can be figured down to a few tons. There can be no great increase from either the Gogebic or Marquette range next year, and the Menominee is not in shape to add much more than they. New districts need not be counted on for any additional shipments, even if they show sufficient quantities of good ores, for it takes time to open mines and arrange the details of business in connection with the shipment of their ores.

Great Trouble With Flooded Mines.

The main difficulties of the Mesabi range for the year were those mentioned. Scarcely a month passed during the season when the largest open pit mines were not flooded from excessive rainfall. In many instances they were not only flooded but their ore bodies were swamped by mud. In cases it happened that underground properties were filled with mud, not once in the season but on one occasion three times in a single day. The open pits were no sooner cleared of water and silt than they filled up again, and the energies of the shippers were devoted to buying and installing pumps. On one occasion every mine pump to be had in the wholesale establishments of the northwest were bought in one day, as additional equipment for one of the large companies. This difficulty was far more serious than appears to an outsider, as the very mines whose shipments were depended on to make the heavy total of the year, that is the big open pits, were the ones that suffered most. It is a very surprising thing that these shippers were enabled to maintain such a volume of business as they did, and to press forward the ore as fast as it could be taken away. It was a strenuous season, on all parties connected with the mining and shipping of ore, and the men responsible for the great business are to be congratulated that they have come thro in their right minds.

The Steel Corporation Reserves.

As usual the United States Steel Corporation was the chief shipper of Lake Superior ores, but it is doubtful if its production was proportional to its reserves; in other words it is to be questioned if this vast concern is not conserving its ores in the ground in better shape than its rivals. Its reserves are so inconceivably vast, its ores of such excellent grades and so minable, if that word may be used to describe a condition, that it is able to make records and still to preserve its equilibrium in a most remarkable manner. Its shipments for the year have been proportionally as they have been in recent years, some 55.3 percent of the whole. There is continual talk and speculation as to the proportionate reserves of the Steel Corporation, and the future of the steel trade of America is figured out from the data supposed to be known on this point. But this data is most misleading. The remarks of ex-president Schwab are usually taken as the basis from which total tonnages are worked out, and on them are piled some equally reliable ideas. It is not probable that Mr. Schwab ever told what he really thought as to ore reserves; he said what seemed to him sufficient for the purpose then in mind; he doubtless then knew that he did not express, even conservatively, the reserves of the Corporation. The Corporation has mined from its beginning about 72,000,000 gross tons; it is perfectly safe to say that in no year since it began to look for new ores has it added so little to its reserves in the ground, and if it had 700,000,000 tons four or five years ago it has today better than a billion tons. But the Corporation owns large areas of excellent lands whose ores have not been measured, in some cases not explored and it is a fair guess to estimate that it may mine 20,000,000 to 25,000,000 tons a year for many more years than the most optimistic estimator has yet given it credit for, and still retain enough ore for seed.

Purchase of Ore Lands.

During the year just passed there has been considerable activity in the purchase of ore lands for many consumers. The interests connected with the Lackawanna Steel Co. have been taking up lands, and have purchased several

mines, most of them small Mesabi properties. These interests, too, have explored and are developing some excellent old range properties on the Menominee range. Smaller ore consumers, both for pig iron and steel, have been buyers to some extent, and many of them now estimate that they have ores for a generation ahead. But there are many who have no ores of their own, at least in such small quantities and of such grades as to be considered slightingly.

The Steel Corporation has pursued its policy unflinchingly, and has taken up immense tracts of land and many developed mines, both on the Mesabi and elsewhere. It is now reported, with what truth cannot be ascertained as yet, that the Corporation has invaded the problematical Deerwood district, and is arranging for a large acreage there. This may be of value and it may not, time alone can determine. There has been a year of vigorous exploration, with a small unmber of drills, but the facts as to that district are little better known than a year ago. It is on the western Mesabi that the Corporation's chief interests have lain this year. Its purchase of the Canisteo lands, late in 1904, has been followed by additional large buying in the same region, and the entire district west of the Nashwauk mines is in the hands of either the United States Steel Corporation or the Great Northern road. Both have been active, but of late the former has taken more lands than the Hill interest, and in the past few weeks has closed up on considerable acreages that may, or may not, contain ores, but which lie within the possibilities.

Discoveries On Other Ranges.

A good deal of exploration has been done elsewhere on Lake Superior. The Baraboo region has not added new shippers, and its product for the year has been only about 75,000 tons, but explorations have continued, and with fair results at many points. The district is restricted in its radius of operation, and the water in its ore bodies is too much for the most economical mining, but the single deposit so far opened is of remarkable persistency and continuity. There has been some work in Canada, north of Lake Superior, and west of Fort William, and in the case of the Atikokan district this is proving what had been understood as to the region. In other parts of the north country there has been less of encouragement. East of Lake Superior, in the Georgian bay region, there are signs of activity, and the large Moose Mountain ore bodies are to be opened during the coming year. As soon as railway connections are secured this district can ship ore in considerable quantity, probably as much as the market will be willing to take of its magnetic ores. There remains only the Deerwood region, of Minnesota. In that section drills have been active during the entire year, and have disclosed some ore bodies that seem to be of value. But the main work there has been in very lean non-bessemer iron, often quite high in manganese, and with the newly risen prejudice against manganese this is unfortunate. Some of this manganese runs up to high percentages, but there is generally much phosphorus with it. The bulk of the district is now valueless, but there are doubtless ore bodies that can be mined at a profit, and there is abundant opportunity for further exploration, which will doubtless come at once. Another year and more should be known as to this region.

Tendencies In Mine Operation.

A great quantity of work has been done in Lake Superior mines to prepare them for the output of this year. Up to the close of the year more than 6,000,000 yards of stripping had been moved from mines on the Mesabi range, and some work of the same nature has been carried on at mines of other districts, where it has been found that stripping methods, theretofore peculiarly adapted for the Mesabi, were also applicable. That this method wil extend itself to all districts where it can possibly be applied there is little doubt. Its advantages in the way of costs, tonnage, posibilities of suddenly accelerating its product to meet immediate requirements, the opportunity for mixing ores, the saving in timber, the fewer men and therefore less danger from labor difficulties, and other advantages, will all tend to the adoption of the same system wherever possible. There is a tendency to work away from the milling system in favor of the out and out open pit, and where milling has been considered necessary it is probable that steam shoveling can be operated, if necessary, by the use of a stationary engine to haul the loaded cars of ore out of the pits. More than 6,000,000 cubic yards of material has been moved during the year from open pits on this range alone, and it is probable that the volume to be handled the coming season will be still greater. Contrary to usual conditions stripping continues at a number of mines up to the close of the year, and is to remain active all through the winter. There are many contracts given for new stripping in 1906, and many old ones are to be increased and carried through to completion. The Oliver Iron Mining Co. has ordered an additional equipment of shovels and locomotives for moving dirt that will cost about $1,000,000, and there will be more than 125 steam shovels at work on the range during 1906.

Railroads are very active in preparation for the coming season. They are expending more than $8,000,000 for new docks, new cars and engines and additional track. They will be prepared to move all ore that can be brought to them during the year, and it is probable that such roads as the Duluth, Missabe & Northern can easily move in an ordinary season of navigation about 11,000,000 gross tons. The bulk of extra work will come on the roads serving the Mesabi range, and it is these that are spending the most money and making the most elaborate preparations.

Statistics of the Season.

The shipments of the year, by ranges, have been as follows, with comparisons:

	1905	1904	1903	1902
Mesabi	20,024,882	12,158,008	12,892,542	13,342,840
Menominee	4,700,556	3,074,848	3,749,567	4,612,509
Marquette	3,941,701	2,843,703	3,040,345	3,868,025
Gogebic	3,485,344	2,398,387	2,912,912	3,663,484
Vermillion	1,676,714	1,282,513	1,676,699	2,084,263
Totals	33,829,197	21,882,839	24,289,878	27,571,121

This does not include the Michipicoten nor the Baraboo districts, which have a combined production for the year of about 240,000 tons.

Shipments for the year over docks and by rail for the various roads, so far as all rail shipments can be computed at this time, have been as follows:

Duluth, Missabe & Northern, Duluth docks	8,804,443
Duluth & Iron Range, Two Harbors docks	7,778,768
Chicago & Northwestern, Escanaba and Ashland docks	6,729,975
Great Northern, Superior docks	5,118,385
Lake Superior & Ishpeming, Marquette docks	1,844,823
Duluth, So. Shore & Atlantic, Marquette docks	1,243,388
Chicago, Milwaukee & St. Paul, Escanaba docks	1,310,021
Wisconsin Central, Ashland docks	799,394
Wisconsin & Michigan, Pestigo route	100,000
Other all rail, estimated	100,000

Oil City Plant to Enlarge.—The Riverside Engine Co., the address of which is Oil City, Pa., is running its shop night and day on large gas engines, though it will soon be in a position to turn out smaller sizes. The present plant consists of a building 70 x 180. To this will be added an erecting shop, 60 x 120, equipped with a 30-ton traveling crane and heavy machine tools, a forge shop 25 x 60 and a two-story building 60 x 120 to be used as a power house, shipping department and pattern shop. The buildings will all be of steel concrete construction, with hot blast heating apparatus, electric transmission and light.

FRACTIONAL CHANGES IN INDUSTRIAL SECURITIES.

Changes for the most part only fractional were recorded by iron, steel and manufacturing securities during the past week, which by reason of the embarrassment of the Walsh banks at Chicago, the continuance and spread of the Russian disorders and certain minor occurrences of a discouraging nature, proved a test of the market in a way entirely different from that to which it had recently been subjected. Abnormally high money rates had been found of little effect in checking the activity of the New York exchange. Russian panics even to the extent of threatening to default on national bonds had failed to create alarm, although the market had been the scene for weeks of the wildest speculation. Conservatives who had viewed the trend of affairs with disapproval heard of the Chicago banking troubles and predicted the long-expected crash in prices. The market opened weak, then slumped heavily, but only for a half hour. With the assurance that the Chicago clearing house had guaranteed deposits of the three involved institutions, confidence was restored, on the rebound stocks advanced, and before the end of the week in several cases set new high marks. Union Pacific, on one day's sale of 300,000 shares, went to 147¾, the highest price on record, and twice later in the week reached a higher figure. Railway stocks were the leaders, with industrials comparatively little dealt in and heavy in tone. Tennessee Coal & Iron, on the announcement of its passing to Republic Iron & Steel control, lost several points of the big gains of the past fortnight. The steel stocks were strong, common closing near the 40 mark.

Dividend Declarations.

Recent dividend declarations include the following: Sloss-Sheffield Steel & Iron Co., regular quarterly 1¾ per cent on preferred payable Jan. 2; Cutting Car Co. regular quarterly 2½ percent, payable Jan. 1; Standard Screw Co., regular semi-annual on preferred stock 3 percent and on common stock 2 percent, payable Jan. 1; Standard Coupler Co., common stock, 1½ per cent, payable Dec. 22; Alabama Steel & Shipbuilding Co., regular semi-annual, 3 per cent on preferred stock, payable Jan. 1; American Locomotive Co., regular quarterly on preferred 1¾ per cent, payable Jan. 22.

THE LEADING INDUSTRIAL SECURITIES.

	Closing Quotation Dec. 16	Closing Quo. Dec. 23	Changes	Date of 1905 Ann. Meet.	Par Value	Capital Outstanding	Dividend Basis	Dividend Being Paid	Dividend Date Last Div. Dec.
Allis-Chalmers Co	21⅝	22	+ ⅜	Sept.	100	19,820,000			
Allis-Chalmers preferred	62	62			100	16,150,000	7 cum		Feb., 1904
AmericanCan	9⅛	9	− ⅛	Feb.	100	41,233,300			
AmericanCan preferred	68⅛	68½			100	41,233,300	7 cum	5 Q.	Jan., 1906
AmericanCar and Foundry	40	39⅜	− ⅝	June 29	100	30,000,000			May, 1905
AmericanCar and Foundry preferred	98⅝	99¾	+1⅛		100	30,000,000	7 n. c.	7 Q.	Jan., 1906
AmericanLocomotive	68½	69	+ ⅛	Oct. 17	100	25,000,000			
AmericanLocomotive preferred	116⅜	116⅝	+ ¼		100	24,100,000	7 cum	7 Q.	Jan., 1906
AmericanShipbuilding	58	57¾	− ¼	Oct. 4	100	7,600,000	4	4 Q.	Dec., 1905
American Shipbuilding preferred	105	105			100	7,900,000	7 n. c.	7 Q.	Jan., 1906
American Steel Foundries	13⅛	13⅞	+ ⅝	Oct. 3	100	17,700,000			
American Steel Foundries preferred	47⅝	49¼	+1⅝		100	17,700,000	6 cum		Aug., 1904
Barney & Smith	22½	22½		June 6	100	1,000,000			June, 1893
Barney & Smith preferred	125	128			100	2,500,000	8 cum	8 Q.	Dec., 1905
Bethlehem Steel	32½	32	− ½	April 4	100	15,000,000			
Bethlehem Steel preferred	89½	88	−1½		100	15,000,000	7 n. c.	7 Q.	Nov., 1905
Bullock Electric preferred	112⅞	114	+1⅛	Oct. 1	100	1,000,000	6	6 Q.	Oct., 1905
Cambria Steel	28¼	28¼		March 21	50	45,000,000	6	3 S. A.	Aug., 1905
Cambria Iron	49	49			50	8,468,000	4	4 S. A.	Oct., 1905
Colorado Fuel & Iron	53½	55½	+2	Oct. 16	100	30,132,000	7		Apr., 1902
Wm. Cramp & Sons Ship & Eng. Bldg. Co.	25	25		May 25	100	6,098,000	5		Nov., 1902
Crucible Steel	13⅝	13⅝	+ ⅛	Oct. 18	100	25,000,000			
Crucible Steel preferred	69¾	69¼	− ⅜		100	25,000,000	7 cum		Sept., 903
Empire Steel	7	6	−1	Feb. 22	100	2,281,400			
Empire Steel preferred	39	39			100	2,500,000	6 cum	3 S. A.	Jan., 1901
Fay & Egan	90	90		Feb. 21	100	1,000,000	5	5 Q.	Nov., 1905
Fay & Egan preferred	120	120			100	1,000,000	7 cum	7 Q.	Nov., 1905
General Electric	175	176¾	+1¾	May 9	100	48,256,050	8	8 Q.	Oct., 1905
International Pump	27	27		June 6	100	12,262,500		2	July, 1905
International Pump preferred	80¾	80¼	− ⅝		100	8,850,000	6 cum	6 Q.	Nov., 1905
Lackawanna Steel	81	81		March 8	100	34,971,400			
Lake Superior Corporation	17⅛	17¾	+ ¾		100	40,000,000			
Niles-Bement-Pond	121	121		Feb. 1	100	5,000,000	6	6 Q.	Sept., 1905
Niles-Bement-Pond preferred	103⅝	103⅝			100	2,000,000	6 cum	6 Q.	Nov., 1905
Otis Elevator Co	60	60		March 20	100	6,350,300		2 A.	Apr., 1905
Otis Elevator Co. preferred	107	107			100	5,589,500	6 n. c.	6 Q.	Jan., 1906
Pittsburg Coal Co	15¾	15	− ¾	Feb. 11	100	30,135,000			
Pittsburg Coal preferred	62¾	62	− ¾		100	30,716,200	7		Apr., 1905
Pressed Steel Car	55¼	55⅝	− ⅛	Feb. 15	100	12,500,000	3		Aug., 1904
Pressed Steel Car preferred	99⅞	100	+ ½		100	12,500,000	7 n. c.	7 Q.	Nov., 1905
Pullman Palace Car	245	246	+1	Oct. 19	100	74,000,000		8 Q.	Nov., 1905
Railway Steel Spring	60	59	−1	March 2	100	13,500,000		4 S. A.	Oct., 1905
Railway Steel Spring preferred	103	103¼	+ ¼		100	13,500 000	7 cum	7 Q.	Dec., 1905
Republic Iron & Steel	33⅛	32⅞	− ⅛	Oct. 18	100	27,352,000			
Republic Iron & Steel preferred	104½	104	− ⅝		100	20 852,000	7 cum	7 Q.	Jan., 1906
Sloss-Sheffield	90	88	−2	March 15	100	7,500,000	5	5	Oct., 1905
Sloss Sheffield preferred	110				100	6,700,000	7 n. c.	7 Q.	Jan., 1906
Tennessee Coal & Iron	143	135¾	−7¼	May	100	22,552,800		4 Q.	Jan., 1906
U. S. Cast Iron Pipe & Foundry	45	44¾	− ¼	June 28	100	12,500,000		1	Dec., 1905
U. S. Cast Iron Pipe & Foundry preferred	93	92	−1		100	12,500,000	7 n. c.	7	Dec., 1905
U. S. Steel	38⅛	39¼	+1⅛	April 17	100	508,302,500			Dec., 1903
U. S. Steel preferred	105⅛	105⅜	+ ¼		100	360,281,100	7 cum	7 Q.	Nov., 1905
U. S. Steel 5's	96⅝	96⅝	+ ⅛		100	463,798,000	5	5 A.	
Virginia Iron, Coal & Coke	52¼	48⅛	−4⅛	Sept. 19	100	8,641,600			
Westinghouse Electric	172	176	+4	June 28	50	20,996,350	10	10 Q.	Jan., 1906
Westinghouse Air Brake	157⅛	154	−3⅛	Oct. 3	50	10,990,450	20	20 Q.	Jan., 1905

Sloss-Sheffield Operations.

The operations of the Sloss-Sheffield Steel & Iron Co., for the year ending Nov. 30, as compiled from the quarterly reports, are as follows:

	1905	1904	Changes.
Net profits	$1,606,516	$910,436	Inc. $696,080
Charges and taxes	240,000	240,000	
Balance	1,366,516	670,436	Inc. 696,080
Pref. dividends	456,000	456,000	
Surplus	910,516	212,436	Inc. 696,080
Previous surplus	2,218,969	2,267,481	Dec. 48,512
Total surplus	3,129,485	2,481,917	Inc. 647,568

CONCRETE FACTORY CONSTRUCTION.

One of the factors now present in the iron and steel business and in any structural work, is concrete construction. This style of construction is the result of evolution and has come to stay. It may be of interest to the readers of *The Iron Trade Review*, to give a general treatment of the development of this industry and the purposes to which concrete is especially applicable. A few years ago the two materials in universal use for the interior construction in mills and factories were timber and steel.

When timber was employed, the slow burning or mill construction which had been developed in New England was almost universally adopted. This in many sections was superseded by steel, for two reasons. First, the loads carried in some places were too heavy for timber, and second, the steel was supposed to be more nearly fire

FIG. 1, FIRST FLOOR OF PATTERN STORAGE BUILDING, BROWN & SHARPE MFG. CO., PROVIDENCE, R. I.

proof. The fallacy of the latter statement has been proved by many disastrous fires. Structural steel is of necessity made up of the aggregation of thin shapes and plates. The lattice column and the Z-bar column give a maximum of strength with a minimum cross section of metal, but this minimum cross section of metal is accompanied with a maximum of exposed surface area compared with the volume of metal and hence when the steel is exposed to heat, it is brought to a high temperature almost instantly.

Some years ago a fire occurred in the tempering department of a large works. The original building was provided with 12 x 12 hardwood posts and a heavy truss of timber. To this was later added a building of about the same area having light Z-bar columns and steel roof trusses. When the steel to be tempered was dipped in the oil bath, some of the bath was always volatilized and this volatilized oil, together with dust in the air, had gradually accumulated on the steel and woodwork alike. The floor of the building was of brick and apparently there was very little in it to burn, especially in the steel end. An accident occurred one day, however, in which some oil became ignited and the flame almost instantly swept through the entire room, feeding upon the oil-soaked dust deposited upon both steel and wood. Before water could be brought to bear upon the fire the steel columns and roof trusses had been heated almost to a dull red, given way and doubled up. The fire started near the center of the building and was equally fierce in both the wood and the metal ends. As quickly as the small amount of oil on the exposed surfaces was burned off, the intense heat of the fire subsided somewhat and it was extinguished in a very few minutes. The wooden posts were found charred less than an inch deep and were simply scraped, re-whitewashed and left in place, but a small amount of work being necessary to repair the roof in the wooden end of the building. The steel end, however, was a complete wreck and a large amount of work was necessary to cut out and separate the tangled mass of bars and shapes.

Such experiences as this led to the fireproofing of all columns which were likely to be exposed to fire. For factory construction fireproofing with concrete was advocated early and ordinary lattice or Z-bar columns surrounded with concrete. It was then discovered that the concrete had sufficient strength to resist crushing strains and carry the entire load without the aid of the steel. As a consequence the modern re-inforced concrete column, containing only a few bars of steel, was evolved.

In many of the older structures concrete columns of this type were used to carry I-beams for supporting the floors of factories, and the lower chord of the I-beam left exposed, the floor being brick or concrete arches sprung between the I-beams. Concrete has not much strength to resist tension and when the exposed lower or tension chord becomes heated in case of fire, it expands and tends to buckle the floor down. The concrete being unable to resist tension gives way, and between the combined expansion of the lower chord and

FIG. 2, FIRE PROOF CONSTRUCTION IN PATTERN STORAGE BUILDING.

the dead load upon the floor, failure results. Where steel is used for supporting a fireproof floor, the lower chord should always be covered. This may be accomplished by metal furring plastered with concrete. More recent practice, however, abandons the use of special shapes, and in their place introduces re-inforced concrete girders, the tention strains being taken up by suitable designed bars. The floors themselves may also be made of concrete slabs re-inforced by bars or wires.

The writer recently visited the office of the Aberthaw Construction Co., in Boston and then looked over considerable of its work and *The Iron Trade Review* is indebted to it for the illustrations accompanying this article. Fig. 1 shows a view of the first floor of the pattern storage building of the Brown & Sharpe Mfg. Co., of Providence, R. I. This floor is used as a general warehouse and shipping room and ordinarily would contain practically no combustible material. As a consequence, the floor above is supported on steel columns made up of plates and angles. The room contains three bays, each of which is equipped with a traveling crane, the supporting I-beams

for which are shown near the top of the posts. The floor above is supported on fire proofed concrete beams and is itself constructed of re-inforced concrete. Fig. 2 shows a view of one of the upper floors of the pattern storage building, just after the concrete work was completed. The steel work and girders are all of re-inforced concrete, as well as the floor. The floor, however, is covered with a thin wooden sheeting, upon which are located the pattern racks or heavier patterns. The marks left by the boards making up the forms for supporting the floor during its construction are plainly visible on the ceiling.

Where it is desired to have the entire building of concrete or fireproof construction the design shown in Fig. 3 can be used. In this case the concrete pillars are constructed with brackets for supporting the traveling crane runways. This brings a somewhat eccentric load upon the

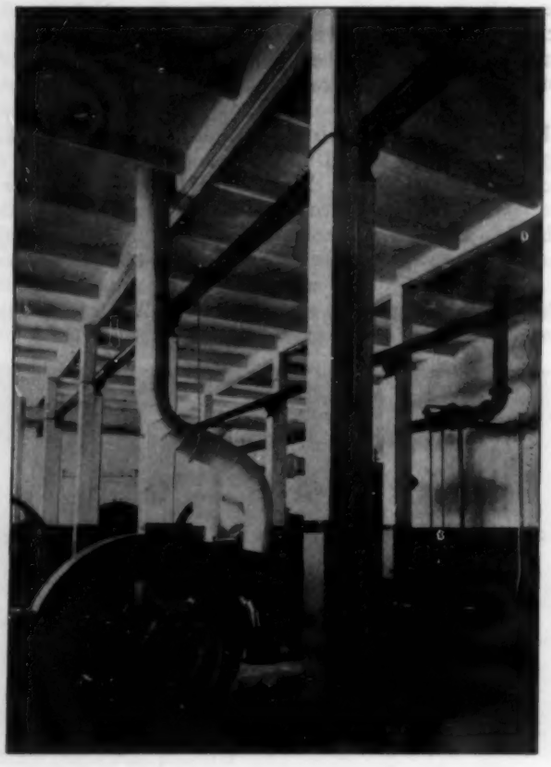


FIG. 3. TRAVELING CRANE SUPPORTED ON RE-INFORCED CONCRETE PILLARS.

pillars, but such loading can easily be taken care of by properly placing the re-inforcing bars. The objection is frequently made that where the concrete construction is used, repairs are impossible. Fig. 3 also serves to show a feature which should be introduced into all concrete work and which has an important bearing upon this subject. A groove will be noticed in the bottom of all of the principal girders. Each of the principal girders is really composed of two independent parallel girders or beams, so that the floor is constructed in panels, each independent of the other. The top of each pillar then carries the corners of four of these adjacent panels. It is true that the re-inforced bars are usually carried straight through over the top of the pillars but this does not alter the case materially. Concrete never expands with heat beyond the size which it occupied when it took its initial set, and hence the use of this double beam construction provides joints which will take care of all contraction or shrinkage. In practice this shrinkage is very small.

If at any time it should be required to make extensive changes in the construction one or more of these panels could be cut out without interfering with the balance of the structure.

At this point, however, it is well to call attention to one current fallacy. Concrete construction looks exceedingly simple and in many quarters the belief is prevalent that anybody could put up a concrete building which would be satisfactory. The number of vexatious difficulties which the concrete engineers have had to overcome, however, is legion, and it is an exceedingly expensive folly for any one to try and dispense with the services of those who have

FIG. 4. SAND STORAGE BINS AT THE FOUNDRY OF BROWN AND SHARPE MFG. CO., PROVIDENCE, R. I.

had a sufficient amount of experience to enable them to avoid these common errors. The unyielding nature of hardened concrete also makes such errors doubly disagreeable, as they are sure to remain before the perpetrator's eyes for a long time. Such errors as this have led to many unwarranted condemnations of re-inforced concrete. The writer has been making something of a study of concrete construction for a good many years and at this point would like to stop and tell a number of stories about how not to do the work, the information for which was gained by observing the other fellow's mistakes, but we believe that the readers of *The Iron Trade Review* want to know about what can be done with concrete, rather than what cannot or should not be done.

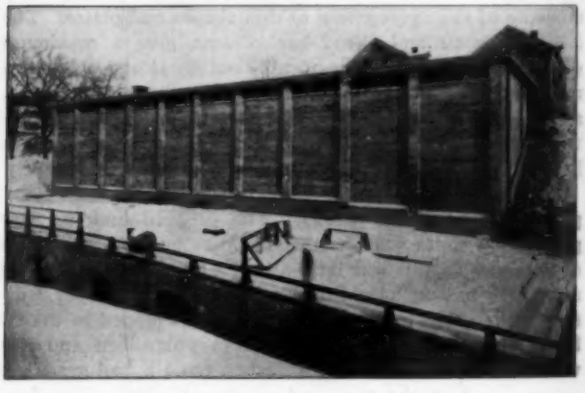


FIG. 5. COKE STORAGE BINS, BROWN & SHARPE MFG. CO., PROVIDENCE, R. I.

One caution which we have heard from a number of prominent concrete engineers is "Do not be afraid to use plenty of re-inforcing bars where they are necessary." In many cases the re-inforcing bars perform their most important function while the concrete is setting by preventing the formation of serious cracks and it is folly to omit them where their presence will insure solid and continuous work.

The question often arises:—"Where can we use concrete to advantage?" To answer this several illustrations are given. Fig. 4 shows a series of 24 bins, constructed at

FIG. 6, GENERAL VIEW OF THE BUILDINGS OF THE UNITED SHOE MACHINERY CO., BEVERLY, MASS., OF CONCRETE CONSTRUCTION.

the new foundry of the Brown & Sharpe Mfg. Co., Providence, R. I. These bins are on a level with the main foundry floor and are used for storing molding sand, fire clay, sea coal and other foundry supplies. The bins are filled through suitable openings in the top, the sand being brought in in wagons and dumped through the holes into the bins. Three openings are provided in the top of each bin. The top of the bins is on a level with the cupola charging platform and is used for storing pig iron, heavy iron flasks, etc.

Fig. 5 was taken some months after Fig. 4 and shows a concrete coke storage bin which was constructed on top of the molding sand bins shown in Fig. 4, the entrance to the bin being at the left hand end and not shown in the

FIG. 7, PATTERN STORAGE OF THE AMERICAN OPTICAL CO., SOUTHBRIDGE, MASS.

illustration. Subsequently the ground at the left of the coke bin was excavated back to the trees shown and a building built about the coke bin and on top of the molding sand bins so as to bring the entire pig iron, coke and flask storage under cover. This latter arrangement is simply of general interest, the important point in this article being the use of concrete for the construction of storage bins of this type.

The examples shown in Figs. 1, 2 and 3 illustrate the use of concrete for general shop construction and especially for the interior construction. Fig. 6 shows a general view of the building of the United Shoe Machinery Co., Beverly, Mass., taken during the construction of the foundry building which is in the foreground. Three of the completed buildings are visible to the right of the foundry building. In this building concrete construction was used throughout for both inside and outside construction. This gives as nearly a fireproof construction as it is possible to adopt, providing a properly constructed fireproof roof is placed on the building. It may be of interest to note that the foundry is located on the second floor of the building shown in the foreground, and the cleaning department, metal pattern shop, pattern storage and so on, on the first floor. A sub-basement is provided for the storage of molding sand and other supplies. This arrangement was adopted after a very careful examination of both styles of construction, plans having been drawn for the ordinary type of foundry and for the type used and both compared point by point. The construction has proven so successful that an addition is now under way which will double the size of the foundry.

One of the points where concrete construction is especially useful is for small isolated buildings which must be fireproof. Fig. 7 shows a small pattern storage built for the American Optical Co., at Southbridge, Mass. This is of concrete construction throughout and is equipped with metal shutters for all exterior openings.

REINFORCED CONCRETE APPLIED TO MODERN SHOP CONSTRUCTION.

Note.—A paper with the above title was presented at the recent meeting of the American Society of Mechanical Engineers, by Mr. E. N. Hunting, of Pittsburg, Pa. The paper dealt mostly with the construction of the shops of the Taylor-Wilson Mfg. Co., of McKees Rocks, Pa., and the accompanying matter is taken largely from the paper, though some of the illustrations are from photographs furnished by the Taylor-Wilson Mfg. Co.

The subject of shop construction is one of the most important problems that the mechanical engineer has to solve, as economy and limitation of capital render this problem one of great difficulty. Modern business methods require that the money invested shall return a substantial percentage of profit. Consequently it has been necessary for the mechanical engineer to devise some substitute for fireproof steel construction that will answer the same purpose. This article sets forth some of the advantages of re-inforced concrete.

Concrete is a mixture of sand, stone, cement and water. The increased demand for cement has caused plants for its manufacture to spring up in almost every locality. Sand, stone and water can be obtained everywhere locally. The mixture of the aggregates can be made by very efficient mechanical devices or by the use of the most ignorant class of labor—with the same good result. This mixture when completed can be moulded to any shape or form from the rough foundation to the most artistic design of cornice or capital. The steel reinforcements are of standard sizes and shapes and are readily obtainable in any market on short notice. The tonnage of this steel work is small and of very light section and requires no apparatus to set in position.

As a structural building member reinforced concrete shows a very economical distribution of material. Steel

is provided to take care of all direct tensional stresses and those shearing stresses for which the concrete is not sufficient. Compressive stresses are taken care of by the concrete. In other words, at least one-half the stress in a

FIG. 1, FRONT OF THE MACHINE SHOP AT THE TAYLOR-WILSON MFG. CO.'S NEW PLANT.

beam is provided for by the concrete whose unit cost is comparatively low. The discussion of the various methods of calculation used in beam design has been very thoroughly taken up by our technical journals and would require a paper in itself to thoroughly cover the ground. Most theories advanced are, however, based upon the common theory of flexure, no allowance being made for tension in the concrete. The theoretical discussion has been developed to a great extent by European engineers.

mittee of experts composed of H. B. Parsons, M. Am. Soc. C. E., S. C. Weiskopf, M. Am. Soc. C. E., and Carl Grieshaber, the conclusion was that reinforced concrete surpassed all other materials for fireproof qualities.

FIG. 2, VIEW ON TOP OF ROOF DURING CONSTRUCTION.

Durability.

Forces of nature, no matter how severe, have but little effect on concrete. Subjected to severe tests of acid fumes and high temperatures as was the case at the fire at the Pacific Coast Borax Co.'s plant at Bayonne, N. J., concrete showed but slight signs of deterioration. Edwin Thacher, M. Am. Soc. C. E., in a paper before the International

FIG. 3, INTERIOR OF MACHINE SHOP.

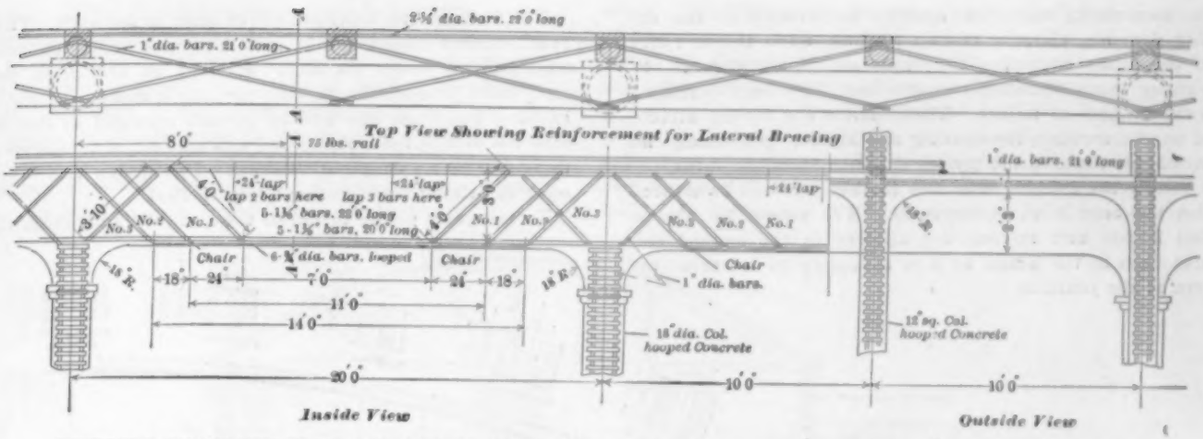
Fireproof Quality.

Concrete is a poor conductor of heat. Subjected to a high range of temperature, concrete gives up a part of its water of combination and becomes a much poorer conductor of heat than before. Hence, there is but little danger of the tension steel in a beam giving away when well protected by concrete. After an examination of fireproof buildings in the path of the Baltimore fire by a committee of experts composed of H. B. Parsons, M. Am. Soc. C. E., S. C. Weiskopf, M. Am. Soc. C. E., and Carl Grieshaber, the conclusion was that reinforced concrete surpassed all other materials for fireproof qualities.

Engineering Congress points out a number of tests that show that steel properly protected by concrete will not deteriorate.

Economy.

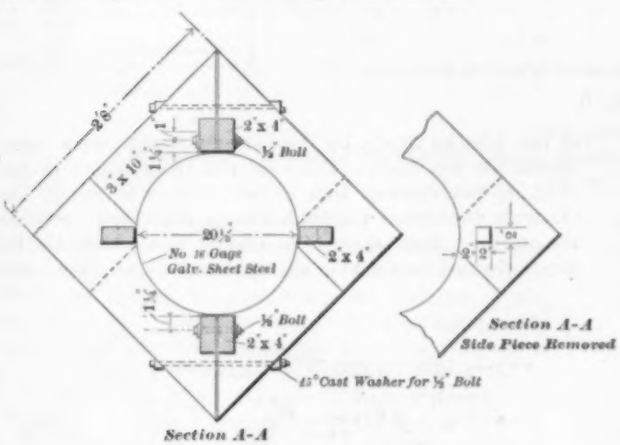
In shop construction, reinforced concrete is from 10 to 20 per cent cheaper than a similar design of fireproofed structural steel. The largest cost item for concrete construction is the forms. It can be readily seen that any

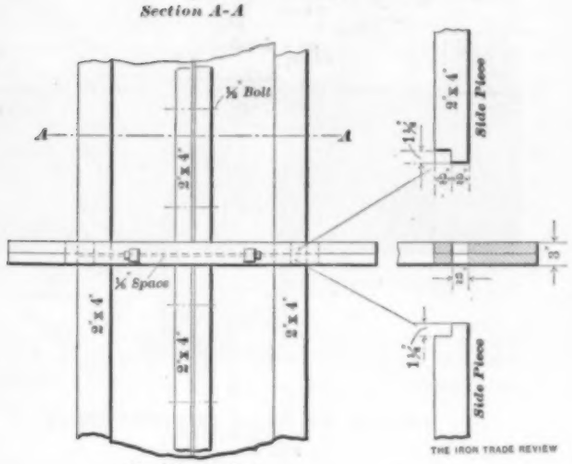


DETAILS OF CRANE RUNWAY FOR 30-TONS CAPACITY CRANE

FIG. 5.

decorative work adds materially to this item—while the concrete itself costs no more in an artistic cornice than in any floor or beam—the mold in which it is placed requires the employment of highly paid skilled labor in its manufacture. Compared with slow burning types of construction, the costs vary in different parts of the country. In some sections reinforced concrete can be built for almost the same figure as slow burning construction.



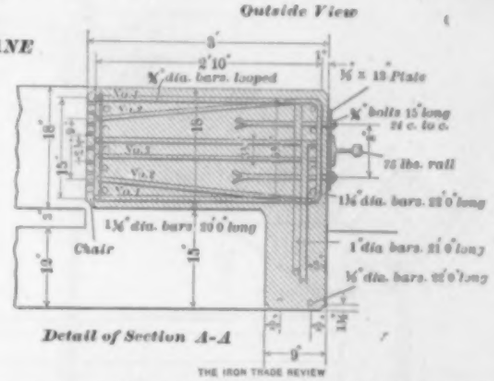


Form for 20-inch Circular Column.

FIG. 4.

Effect of Fire on Structural Steel.

It seems almost incomprehensible that in the modern



structural steel machine shop there is sufficient inflammable material to cause a destructive fire. It is true, however that but very little fire is necessary to make a structural steel member give away when under stress.

Shops of the Taylor-Wilson Mfg. Co., McKees Rocks, Pa.

The ruling factors in the design of the Taylor-Wilson Mfg. shop were:—

Firstly. It should be an absolutely fireproof building.

Secondly. It should be built at a minimum cost.

Thirdly. Provision should be made for heavy craneways.

Fourthly. The design should have some artistic value.

The shop is 160 ft. long and 102 ft. wide and is carried on a series of foundation piers running down an average of 12 ft. to hardpan. These foundations were put in and a fill made around them. In the rear of the building which is on swampy ground, this fill was about 22 ft. In plan the shop consists of a center aisle 51 ft. 7 in. wide—2 leantos 18 ft. on one side and 30 ft. wide on the other.

Columns.

The entire building load is carried on four rows of columns. Two outside rows of 12 in. square and two inside rows of circular columns 20 inches in diameter.

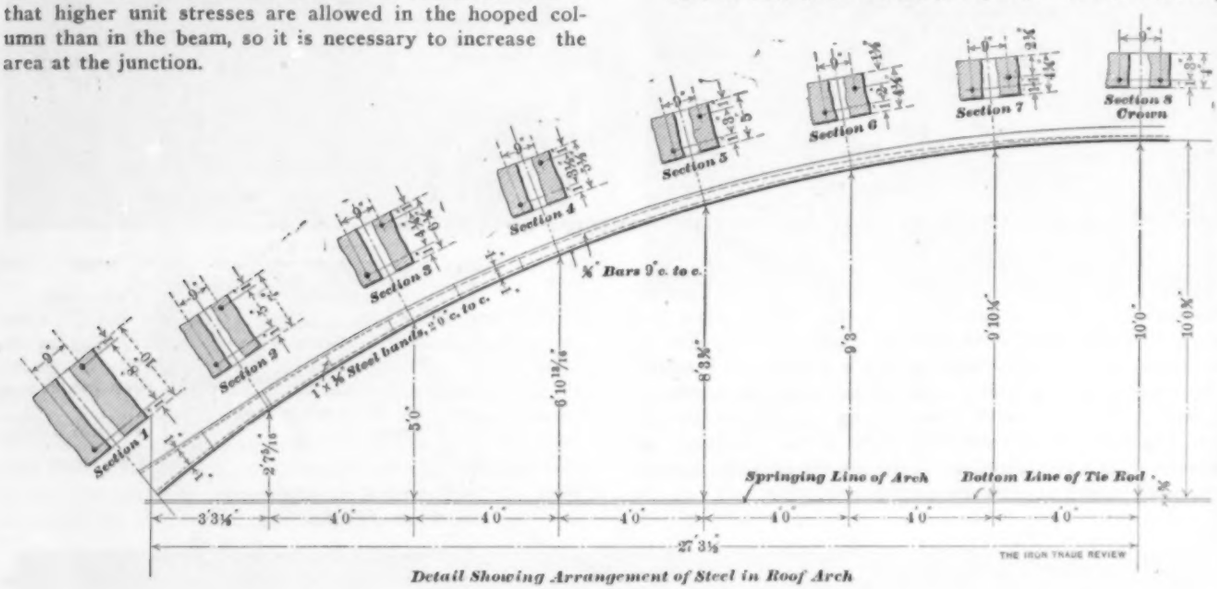
Fig. 4 shows the method used in the construction of the moulds for the 20-in. circular columns. These moulds were formed of 16 gauge galvanized iron and were very satisfactory, giving a perfectly true and smooth surface. The column reinforcement consists of four vertical rods to which were attached a series of hoops 1½ in. wide and ⅛ in. thick, spaced four inches apart. In this connection it might be well to state that the vertical rods are considered useless as far as carrying the load is concerned, and come into play only when the column acts as a beam due to eccentric loading. The theory of this design is that compression is not a stress in itself, in reality failures by compression are failures by secondary tensional stresses within the material. It has been found by a long series of tests that a column failure is always due to a tendency of

the concrete to bulge, consequently the strength of this design depends, above a certain loading, upon the strength of the bands encircling the concrete. Unit stresses as high as 10,000 pounds per square inch have been developed without signs of failure. These bands are rigidly attached to the verticals for spacing and have a projecting fin that holds them to the proper distance from the form.

Where the column runs into the beam it will be noticed that the area is to be increased. The reason for this is that higher unit stresses are allowed in the hooped column than in the beam, so it is necessary to increase the area at the junction.

Fig. 6 shows the arrangement of steel in the arch. This reinforcement consists of ⅝ inch bars nine inches on centers, running across the arch. Running up and down the roof, laced between the ⅝ inch bars are a number of strips of band iron from one inch by ⅛ inch arranged so that in case the rods at the intrados and extrados act in compression there will be no danger of bucking. This design was based upon the elastic theory, using Cains' method.

To take care of the thrust of the arch—tie rods made up



Detail Showing Arrangement of Steel in Roof Arch

FIG. 6.

Beam Construction.

Fig. 5 shows the main beam of the building—the crane girder. This girder was designed for a 30-ton crane , and spans 20 ft. between the circular columns. In section the beam is 18 x 36 in. and has an upper flange. This upper flange takes care of the thrust due to the cross travel of the crane.

Fig. 5 shows the reinforcement, practically in the form of a Pratt truss running continuously over the columns. The bars are in the form of loops bent up at the ends to take care of the shearing stresses. The advantages of this loop are that it is self supporting and utilizes the material economically. While a great deal of metal is necessary at the center of the span to take care of the tension, due to bending moments, these bending stresses decrease towards the supports and the same metal section is not required at the bottom of the beam, so is utilized to take care of the shearing stresses. For supporting the rods and keeping them spaced properly and away from the, form, a little device stamped from sheet metal is used. This spacer is notched out and parts bent to support it—leaving openings to receive the bars. It was found to be far better than any system of conrrete block supports for the reason that it held the bars rigidly in their proper position.

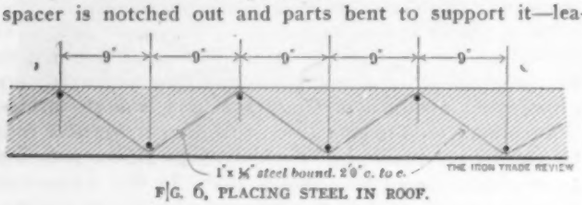
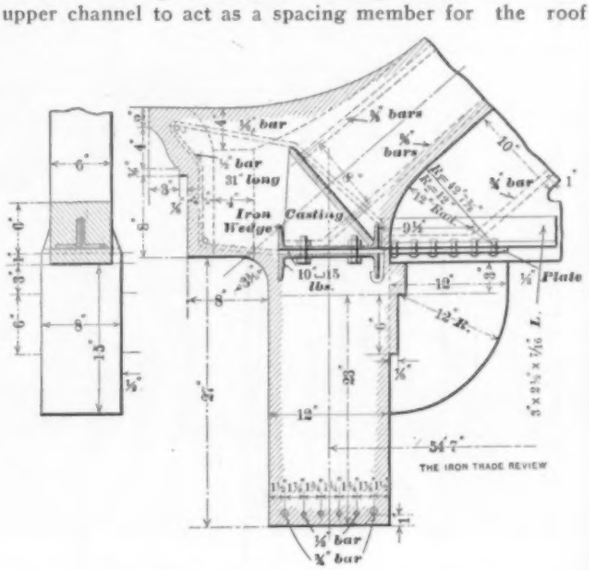


FIG. 6, PLACING STEEL IN ROOF.

Arch Roof Design.

Covering the main aisle—spanning 54 feet—a concrete arch was constructed four inches thick at the crown and ten inches at the haunches.

of two 3-in. by 2½-in. by 7-16 angle irons were used, spaced ten feet apart. These tie rods were bolted to two 10-in. 15-foot channels back to back, shown in Fig. 8. The channels distributed the load, due to the thrust between the rods. A light skew back casting was placed in the upper channel to act as a spacing member for the roof



DETAIL OF ROOF CONSTRUCTION

FIG. 8.

rods and to transfer the load to the tie rods. To take care of the uncommonly large temperature stresses that would naturally be developed in such a large thin area—expansion joints were made every ten feet in the arch. The entire arch was constructed during the coldest winter

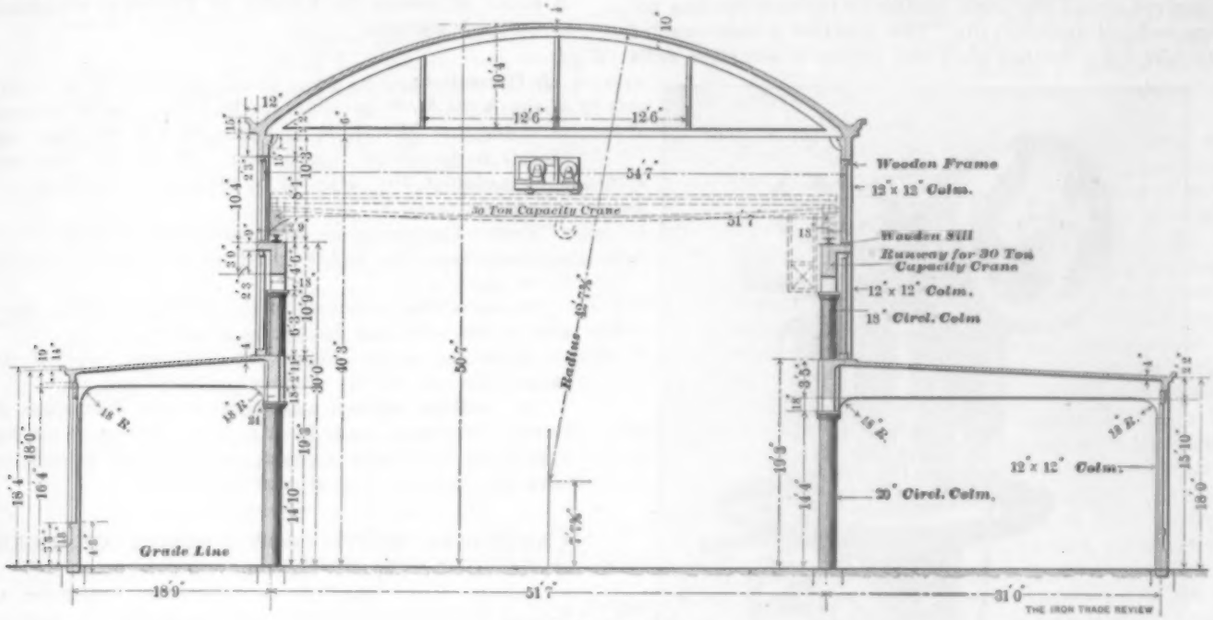
months. Although winter construction in concrete is not commonly considered good practice among engineers, we are of the opinion that cold weather is the most advantageous time to handle this class of work. The reason for this statement is that when temperatures are low the aggregates of concrete are of the smallest volume and contraction due to temperature stresses is seldom found on work carried out in the winter. Cracks seldom develop from expansion—almost entirely from contraction.

dows. The light inside the shop is nearly as good as out of doors.

Fig. 10 shows a cross section with crane in place, giving general dimensions of beams, columns, etc.

Conclusion.

The cost of this work was approximately 3¼ cents per cubic foot of building. The building as completed is as near fireproof as is possible in any style of construction to build. As for repairs it will need none. Paint is unnecessary on its surface to protect from the elements. The insurance rate made by the board of Fire Underwriters is 30 cents per hundred, and it is considered by them to be the best risk in the Pittsburg district.



Cross Section

TAYLOR & WILSON MACHINE SHOP, McKEES ROCK, PA. REINFORCED CONCRETE.

FIG. 10.

Protection from Frost.

It was necessary to adopt some heating system to prevent the work from freezing during winter construction. A system of heating by live steam was installed. Any system for heating concrete work that does not provide moisture as well as heat should not be considered. It is absolutely essential that concree should not be forced to take its set quickly. Concrete that is reinforced with steel should not be protected from freezing by the use of salt. The reason for this is obvious—salt and air corrode steel quickly, and concrete, especially concrete placed in the

FIG. 9, STEEL RE-INFORCING FOR ONE OF THE COLUMNS.

winter, is liable to be somewhat porous and air will get in. The heating system by means of live steam jets was very satisfactory and no bad effects were experienced from the frost.

In General.

On the front elevation of the building, the concrete mouldings about the arch windows and the cornices are tinted to a dark red color that has a very pleasing effect to the eye in combination with the dull gray of the concrete.

The side elevation is almost entirely taken up by win-

The works were designed and built by Robert A. Cummings, M. Am. Soc. C. E., and was under the direct supervision of E. N. Hunting.

CANADIAN NEWS NOTES.

(Special Correspondence.)

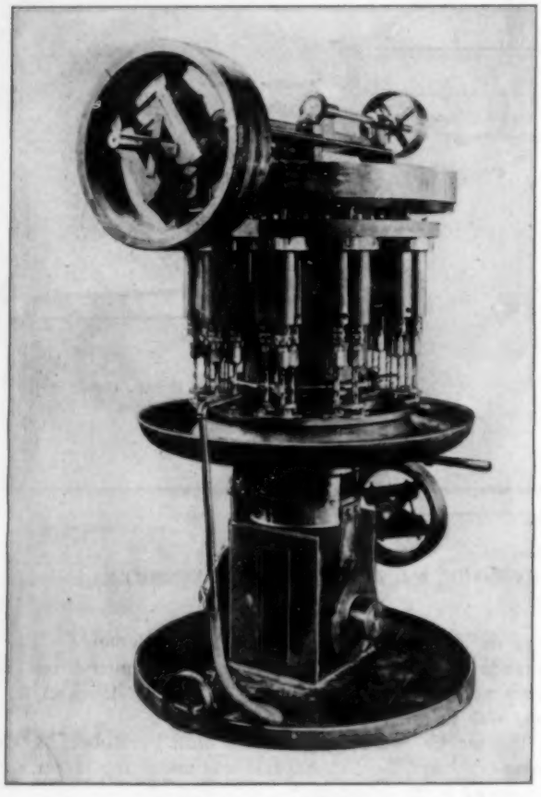
Toronto, Can., Dec. 23.—The branch factory of the Massey-Harris Co. agricultural implement manufacturers at Stratford, Ont. will be removed to Toronto in pursuance of a policy of concentration. The Massey-Harris Co. about a year and a half ago took over the Kemp Manure Spreading Machine Co.'s factory, Stratford, which it has since operated employing over 100 men. It has been erecting expensive new buildings on Strachan avenue, Toronto, near the main factory. These will be used mainly for storage and the Stratford plant will be moved into the buildings now employed for storage. A large quantity of additional machinery will also be installed. The Stratford factory will be closed when present orders are filled.

A prosecution has been begun against members of the alleged tack combine in the courts here. The firms proceeded against include the Portland Rolling Mills Co. St. John, N. B.; Montreal Rolling land Rolling Mills Co., St. John, N. B.; Montreal Rolling Mills Co., United Shoe Machinery Co., Montreal; the Peck, Penny Co., Montreal; Ontario Tack Co., Hamilton, Ont.; James Pender & Co., St. John, N. B.; and Pillow Hersey Co., Montreal and Guelph.

A MANUFACTURERS' GANG DRILL.

The Moline Tool Co., Moline, Ill., manufacturer of gang drills and special machinery, is building a manufacturers' drill in which 36 spindles are arranged in a circle in groups of four. The spindles are capable of being adjusted vertically to allow for varying lengths of drills and in addition to the movement of the spindle due to the feed mechanism, the table of the drill is also adjustable vertically.

The piece of work is carried in jigs on a ring which revolves around the center column of the tool, the ring being indexed automatically. The operator is thus enabled to take out a finished piece and replace it while the drills



MANUFACTURER'S DRILL.

are running continuously. There are ten jigs on the ring and the head of the machine is spaced for ten drill carrying heads. One, however, is left out and as a result there is always one jig immediately in front of the operator which is not in line with any drill head. A rotary oil pump supplies the machine with lubrication and a receiving tank serves also as a reservoir from which to draw.

The machine is automatic throughout except that the work is moved by hand. The machine may be set for a piece of work on which a maximum of 36 operations are required so that such a piece may be put in and after having been around the circle can be taken out completed and replaced by another. Any number of heads can be arranged on the machine to suit the various needs of the manufacturer.

Two More Large Freighters.—The Cleveland-Cliffs Iron Co. has closed a contract with the Great Lakes Engineering Co., through President Pessano for another great steel ore freighter, a duplicate of the two recently ordered from the same builders. The vessel will be 550 feet in length over all, will be in the 10,000 ton class and will cost about $400,000. It will be completed about September. Boilers of increased power will be installed as a safeguard against damage by storms. The Great Lakes Company now has contracts for seven steamers of the 10,000 ton class besides a big car ferry to be turned out by the St. Clair plant. W. H. Becker, who recently contracted with the American Shipbuilding Co. for a 7,500 ton freighter for the ore trade, has ordered from the same concern another boat, a duplicate of the original order except as to length, the latter boat being four feet shorter and from 500 to 1,000 tons smaller in carrying capacity. It will be named in honor of Joshua W. Rhodes, of Pittsburg, prominent in the iron business.

A Correction:—*The Iron Trade Review*, in its report of the A. S. M. E. meeting, in the Dec. 14 issue on page 28 states that Mr. H. F. J. Porter said in his paper on "Ideals in Industrial Engineering": "From the shopowners' standpoint, the ideals to be realized in industrial engineering are:—

"First.—The producing of a marketable product which will command the highest price of any similar product in its class.

"Second.—The producing of the greatest possible quantity of this article at the lowest possible cost.

"There are several phases of the human side of the shops, that are strictly engineering problems, etc."

The crediting of these statements to Mr. Porter was an error. They were made by Mr. Hugo Diemer in his discussion of Mr. Porter's paper, and are quite at variance with Mr. Porter's treatment of the subject.

CANADIANS WANT IRON BOUNTY CHANGED.

(Special Correspondence.)

TORONTO, CAN., Dec. 16.—An important conference of mining men and others interested in the development of the mining industry was held here this week commencing on the 12th inst. and lasting four days. It was called at the instance of Hon. Frank Cochrane, Ontario Minister of Lands and Mines for the purpose of obtaining their views in regard to proposed changes in the mining laws. Among numerous recommendations made were that locations might be taken up before any actual discovery of mineral had been made provided a certain amount of actual mining work was done within 90 days; that all public lands whether timbered or not should be open for location; that no bounties should be paid for pig iron smelted from foreign ores, but that the bounty on pig iron made from domestic ores be placed at $3 per ton for the next 5 years; and that government should offer prizes for the demonstration of satisfactory methods for treating refractory ores. Hon. Mr. Cochrane assured the conference that their recommendations would carry great weight with the administration.

The experimental electric smelting operations at Sault Ste. Marie now being conducted under the supervision of Dr. Heroult of France are making excellent progress. Dr. Haand, superintendent of mines at Ottawa, has received a sample of the first pig iron turned out and pronounces it satisfactory.

The Economical Manufacturing and Supply Co., Ltd., has been incorporated under the laws of Ontario, head office, Toronto, capital $40,000, to manufacture engineers' and steam users' supplies. The provisional directors are: Henry. L. Brown, Samuel Behan, Wm. J, Boland, Thomas J. Walsh and Wm. H. Crow.

Concrete Pile.

The concrete engineer is not satisfied with constructing the building and foundations of concrete, but must needs displace the old standard wooden piles with re-inforced concrete piles.

NATURAL GAS UNDER STEAM BOILERS.*

BY JAY M. WHITMAN.

The writer was recently called upon to give an opinion regarding the commercial operation of a particular mill, both with natural gas and coal, at a certain price. No detailed data of any special or determinative value could be found in available handbooks and other publications. This paper has been prepared to put on record the results of the author's investigations so as to aid engineers in reaching a fair conclusion on the problem from a commercial standpoint.

Value of Natural Gas Products.

The Aug. 7, 1905, Press Bulletin, No. 192, of the U. S. Geological Survey, shows that the value of the present natural gas production of 19 States and Territories of this Union, exclusive of the natural gas produced in Canada and consumed in the States, was $38,496,760 in 1904.

In making this figure, Pennsylvania stands first, with a production valued at $18,139,914; West Virginia is second, with a product valued at $8,114,249; Ohio is third at $5,315,564; Indiana fourth at $4,342,409, while various other States and territories make up the balance.

Most of this gas is used for combustion purposes, and much of it for steam production. Hence any information as to the use of such gas in steam generation may be of interest and value.

Composition of Natural Gas.

The composition of natural gas varies somewhat with the locality as shown in the 1903 report of F. H. Oliphant to the Director of the U. S. Geological Survey in a paper entitled "The Production of Natural Gas."

The heating values of natural gas per cubic ft., in said report, vary from 1037 to 1287, being referred to 32 degrees Fahr. and 29.92 in barometer.

Supplemental to the analysis of the West Virginia gas, as given in said report, are the following made for the writer. These tests relate to gas from nine wells in Lewis Co., W. Va., three miles north of Weston, and used on the Cook boiler tests given later on.

Sample number	1	2	3
Illuminants	0.45	0.15	0.50
Carbonic Oxide	0.00	0.00	0.15
Hydrogen	0.20	0.30	0.25
Marsh Gas	81.05	83.20	83.40
Ethane	17.60	15.55	15.40
Carbonic Acid	0.00	0.20	0.00
Oxygen	0.15	0.10	0.00
Nitrogen	0.55	0.50	0.30
British heat units in a cubic ft. of gas at 60 degrees F. and 14.7 lb. barometer available for useful effect	1030	1020	1026

Also the following analysis of a mixture of natural gas from the fields in the three States supplying Pittsburg, Pa., made in September, 1905, for the writer, may be of some interest:

Illuminants	1.6	percent.
Carbonic Oxide	1.8	"
Hydrogen	0.3	"
Marsh Gas	81.9	"
Ethane	13.2	"
Carbonic Acid	0.0	"
Oxygen	0.4	"
Nitrogen	0.8	"
	100.0	percent.

Heat units per cubic ft. at 60 degrees Fahr. and 29.92 in. barometer..... 1098 B. T. U.

Testing of Gas Meters.

In any test, for any purpose whatsoever, of the use of natural or other gas for a useful effect, it is important that the amount used shall be truly determined. The gas meter can best be tested by the following method employed by the Equitable Meter Co., of Pittsburg, which method appeals to the writer as being complete and exact. It is described by the company's engineer, Mr. George W. Barnes, as follows:

"The testing apparatus we use, in lieu of a better name, we call a flow meter and it is constructed as follows: First, we have an inner cylinder, 24 in. by 24 in., perforated with as many ¾-in. holes as it will contain. Outside of this perforated cylinder we build another cylinder perforated with carefully calibrated holes of 1½ in. diameter, and of a sufficient number to give us a volume sufficient to test a meter using 250,000 cubic ft. per hour. The rest of the apparatus is simple, consisting of gauges and a blower of sufficient size to give us the required volume of air at the required pressure.

"These holes in the outer cylinder or drum will discharge at a 4-in. water pressure and at a temperature of 60 degrees Fahr. and a barometric pressure of 30 in., one cubic ft. per second, or 100 cubic ft. in 100 seconds.

"Our connections are made up as follows: We connect the meter to the outlet of the blower and our flow meter to the outlet of the meter, and operate our blower continuously and govern our pressure by a regulator placed between the blower and the meter. Our pressure is taken from the outlet of the flow meter, and the temperature is obtained at the same point. If the conditions are all as just stated, we maintain the pressure of 4 in. of water pressure. If either the temperature or the barometric pressure vary from the above, we vary our pressure to suit the conditions, thereby maintaining a constant flow of one cubic ft. per second for each hole, in the shell of the outer drum. We then take time with a stop-watch, allowing the meter to run 100 ft., when we note the time required. If more or less than 100 seconds are required, the error is computed from the 100 seconds, and an adjustment is made in the meter, and the corrections are made accordingly. The run of one 1½-in. hole or outlet will give a test on a meter at a flow of 3,600 cubic ft. per hour. After making the above test we remove the stopper of another 1½-in. hole and make the flow at the rate of two cubic ft. per second, or 7,200 cubic ft. per hour, or two revolutions on the 100-ft. dial of the meter in 100 seconds, and correct as above noted. This we continue to do in multiples of 3,600 cubic ft. per hour until the full rate of capacity of the meter has been reached and adjustments have been made at each period through the run.

"This method we think the most nearly perfect to be had, inasmuch as it gives us our tests upon the meter with the actual volumes as required in general service.

"The formula used in determining the pressure required with different temperature and barometric pressures was arrived at by making the runs through the orifices from an accurately calibrated displacement prover. The experiments covered a period of some 18 months and have been tried under all of the varying conditions obtainable during that period, while we have also checked back, by the formula, to the barometrc reading, temperature and pressure, where each were obtained accurately from instruments, and in all cases we have proved that our formula was absolutely correct for the aforesaid 1½-in. orifices."

Burners to be Used

The writer has investigated several of the gas burners upon the market and concludes that there is but little difference between them from an efficiency standpoint.

The following boiler tests made separately with 10 Gwynn and 10 Kirkwood burners supplying a 250-h. p. Cook water tube boiler, having a "dog-house" furnace, the burners being placed in the front and at a level slightly

* A paper presented at the meeting of the American Society of Mechanical Engineers, New York, December, 1905.

above the furnace doors, the furnace having an imperfect "check-wall" in each case, and the burners being operated by experts in each case, shows that the question of burners may be eliminated.

Kind of burners	Gwynn.	Kirkwood.
Duration of tests in hours	8	8
Barometers, lb.	14.25	14.25
Boiler gauge pressure, lb.	126.5	122.0
Draft under damper, in.	0.24	0.13
Gas pressure at burners, ounces	3.84	4.50
Gas temperature at burners, Fahr.	45	45
Chimney temperatures, Fahr.	557	573
Feed-water temperatures, Fahr.	33.0	33.6
Cubic ft. of gas used	95,551	94,388
Cubic ft. of gas at 60 Fahr. and 4-ounce pressure	98,348	97,420
Water pumped and evaporated, lb.	70,240	70,030
Boiler h. p. rated	250	250
Boiler h. p. developed	254.5	253.7
Actual cubic ft. of gas per boiler h. p.	46.8	46.4
Cubic ft. of gas at 4-ounce pressure, 60 deg. Fahr. and 14.25 lb. barometer per boiler h. p.	48.3	48.0

Blue vs. Straw Flames.

The writer has always been led to believe that a blue flame meant the burning of carbonic oxide into carbonic acid gas, although some authors define it as representing the burning of hydrogen into water. Whichever is denoted by the blue flame, no flame of any color is formed at a temperature below about 1,000 degrees Fahr.

The writer conducted tests on six of the aforesaid 250-h. p. Cook boilers with such a blue flame in the combustion chamber, and, also, complementary tests upon them with a straw-white flame, with the following results:

Kind of flame	White.	Blue.
Test with 4-ounce gas pressure at burners No.	793	No. 798
No. of 250-h. p. Cook boilers tested	6	6
Steam gauge pressure, lb.	112	88
Draft under boiler damper, in.	0.42	0.52
Pressure at the meter registering the gas used, ounces	18.9	19.8
Gas temperature, Fahr.	46	42
Chimney gases, Fahr.	436	503
Feed-water temperatures, Fahr.	172	178
Cubic ft. of gas used at meter pressure	167,420	147,310
Cubic ft. of gas used at 4 ounces pressure and 60 deg. Fahr.	182,255	162,210
Water evaporated, lb.	141,566	123,344
Equivalent water evaporated from and at 212 Fahr., lb.	153,400	132,311
Boiler h. p. made by six 250-h. p. boilers	1,482.1	1,278.4
Boiler h. p. made per 250-h. p. boiler	247	213.1
Cubic ft. of gas used under actual gas meter pressures and temperatures per boiler h. p.	37.7	38.4
Cubic ft. of gas at 4-ounce pressure and 60 Fahr. per boiler h. p.	41.0	41.0
Openings of gas burner lids	Throttled.	Wide Open.
No. of 6-in. Kirkwood burners used by the six boilers	60	60

These tests showed an advantage in capacity in favor of the "white" flame in the furnace at 4 ounces gas pressure at the burners, but no advance in economy.

Test with 6-ounce Gas Pressure at the Burners.

Kind of flame	White.	Blue.
No. of 250-h. p. Cook boilers tested	6	6
Steam gauge pressure, lb.	116	99
Draft under boiler dampers, in.	0.51	0.52
Gas pressure at the meter, ounces	16.5	19.1
Gas temperature, Fahr.	44.3	42
Chimney temperature, Fahr.	478	511
Feed-water temperature, Fahr.	144	151
Cubic ft. of gas used	222,320	185,218
Cubic ft. of gas at 4 ounces and 60 degrees Fahr.	241,516	205,424
Water evaporated in the boilers, etc.	165,365	152,600
Equivalent water evaporated from and at 212 Fahr., lb.	184,167	168,333
Boiler h. p. made by six 250-h. p. boilers	1,779.4	1,626.4
Boiler h. p. made per boiler	296.6	271.1
Cubic ft. of gas used under actual gas meter pressures and temperatures per boiler h. p. per hour	41.6	37.9
Cubic ft. of gas at 4-ounce pressure and 60 Fahr. per boiler h. p. per hour	45.2	42.1
Opening of gas burner lids	Throttled.	Open Wide.
No. of 6-in. Kirkwood burners used	60	60

Again, these tests showed a capacity advantage in the use of white flame, but in this case at the sacrifice of economy.

Tests were then made with the gas at a burner pressure of 8 ounces with the following results:

Tests with 8-ounce Burner Pressure.

Kind of flame	White.	Blue.
No. of 250-h. p. Cook boilers used	6	6
Steam gauge pressure, lb.	128	128
Draft under boiler damper, in.	0.51	0.54
Gas pressure at the meters, ounces	19.8	18.9
Gas temperature, Fahr.	42	43.3
Chimney temperature, Fahr.	502	508
Feed-water temperature, Fahr.	157	184
Cubic ft. of gas per meter	183,600	176,510
Cubic ft. of gas at 4-ounce pressure and 60 Fahr.	203,044	194,004
Water evaporated, lb.	143,864	131,570
Equivalent water from and at 212 Fahr., lb.	158,596	141,319
Boiler h. p. made	1,532.2	1,365.4
Boiler h. p. per boiler	255.4	227.6
Cubic ft. of gas used under actual gas meter pressures and temperatures per boiler h. p. per hour	40.0	43.1
Cubic ft. of gas at 4-ounce pressure and 60 Fahr. per boiler h. p. per hour	44.2	47.2
Opening of gas burner lids	Throttled.	Open Wide.
No. of 6-in. Kirkwood boilers used by the six boilers	42	46

These 8-ounce burner pressure tests showed an advantage in both economy and in capacity in favor of the white flame.

Summarizing these six tests in two sets, we find:

Kind of flame	White.	Blue.
No. of 250-h. p. Cook boilers used	6	6
Average gas pressure at burners, ounces	6	6
Cubic ft. of gas used when reduced to 4 ounces and 60 degrees Fahr.	626,815	561,638
Equivalent water evaporated from and at 212 Fahr., lb.	496,163	441,963
Average boiler h. p. made	1,597.7	1,423.2
H. p. made per 250-h. p. boiler	266.3	237.2
Cubic ft. of gas reduced to 4-ounce pressure and 60 Fahr. used per boiler h. p. per hour	43.6	43.8
Kind of burners	Kirkwood	Kirkwood.
Burner lids	Throttled.	Open Wide.

The six tests when thus consolidated in two tests show that the economy is the same with each and that the capacity is greatest with the white flame.

Accordingly, the remaining tests by the writer, and named herein, were made with the straw-white flame.

Test of Six 250-h. p. Cook Boilers.

The following tests were made under the most careful conditions upon the same boilers previously referred to and equipped with Kirkwood burners. They were conducted after several weeks had been consumed in "check-wall" duration tests.

Duration, hours	16	9
Barometer, lb.	14.3	14.25
Boiler gauge pressure, lb.	120.1	132.7
Draft in front of damper, in.	0.18	0.20
Gas pressure at meter, ounces	16.6	18.0
Gas pressure at burners, ounces	6.9	6.4
Temperature of air	40	69
Fire room	57	73
Natural gas	49	70

Feed-water	151.2	185
Chimney	521	494
Gas metered, cubic ft.	1,101,350	541,420
Equivalent gas at 60 degrees Fahr. and under 4-ounce pressure with 14.7 lb. barometer	1,179,666	555,617
Water evaporated, lb.	818,700	435,625
Equivalent water from and at 212 degrees Fahr., lb.	906,301	467,948
Boiler h. p. made	1,641.8	1,507.0
Cubic ft. of gas, actual, per boiler h. p. per hour	41.92	39.92
Cubic ft. of gas at 4 ounces and 60 degrees Fahr. per boiler h. p. per hour	44.9	40.96
Boiler efficiency, percent	72.7	....

Test of a 200 Horse-power Heine Safety Water Tube Boiler at Herron Hill Pumping Station, Pittsburg, Pa.

Heating surface	2,032 sq. ft.		
Shell	42 inches x 21 ft. 6½ in.		
Tubes	116-3½ in. x 18 ft. 0 in.		
Number of natural gas burners in use		6	
Test made	Jan. 7, '05.	Oct. 21, '04.	Sept. 6, '05.
Kind of gas burners used	Kirkwood.	Kline type.	Kirkwood.
Duration of Test, hours	10	10	10
Test made by	G. I. Bouton.	Bouton.	Whitham.
Steam gauge pressure, pounds	145.8	144.1	149.6
Draft in front of damper, inches	0.14	0.18	0.34
Gas pressure as meter, inside of mercury	1.93	2.35	1.81
Barometer inside of mercury	28.54	28.63	28.99
Temperature of external air, Fahr.	25.3	56.1	69
Temperature of fire room, Fahr.	72.8	74.1	78
Temperature of feed water, Fahr.	40.9	61.1	74
Temp'ure of escaping gases, Fahr.	386	450	465
Temperature of natural gas at meter, Fahr.	58.8	70	79.8
Cubic feet of natural gas used	73,720	92,200	105,400
Cubic feet of natural gas reduced to 60 Fahr. and 29.92 inch barometer	.....	.....	104,521
Cubic feet of natural gas at 32 Fahr. and 29.92-in. barometer	71,199	88,604	98,904
Calorific value of the natural gas per cubic feet in B.T.U. referred to: 29.92-in. barometer 32 degrees Fahr.	1,102	.....	.....
29.92-inch barometer 60 degrees Fahr.	.....	.....	1,098
Moisture in the steam, part of 1 percent	0.50	0.53	0.33
Feed water pumped to boiler, pounds	43,800	62,655	74,922
Feed water evaporated, pounds	43,581	62,323	74,672
Equivalent feed water evaporated from and at 212 degrees Fahr., pounds	53,425	75,	89,024
Evaporation measured in boiler horse-power per hour	154.9	217.8	258.0
Rating of boiler, horse-power	200	200	200
Cubic feet of natural gas used per hour per boiler horse-power developed with gas at:			
29.92-inch barometer and 32 degrees Fahr.	45.97	40.68	38.33
29.92-inch barometer and 60 degrees Fahr.	.....	.....	40.51
Combined burner and furnace efficiency, percent	65.8	.....	74.92

The improvement shown in the last test upon this Heine boiler is largely due to the use of an under and preheated air feed supplemental to the air supply ordinarily carried in through the burners.

Tests of a 302 Horse-Power Vertical Cahall Boiler, at Mansfield, Ohio.

Mr. J. Roland Brown contributes the following tests made with six Merrill burners, the boiler having 3,021 square feet of heating surface.

Duration, hours	7	10
Date of test	Mch. 2, '03	Mch. 5. 03
Boiler gauge, pressure, pounds	95	85.7
Draft in front of damper, inches	0.28	0.7
Gas pressure, ounces	4.8	7 to 30
Barometer and gas temperatures are not given	.....	.....
Feed water temp'ure, degrees Fahr.	46.5	53.3
Chimney	406	374
Cubic feet of gas used	100,700	88,370
Water evaporated, pounds	67,865	74,168
Equivalent water from and at 212 degrees Fahr., pounds	82,171	89,076
Boiler horse-power made	340.2	260
Cubic feet of metered natural gas used per hour per boiler horse-power	42.26	34

The last test was made with gas at a high pressure, varying from 8 to 30 ounces, and the average pressure is not stated.

Burner Tests.

Mr. Daniel Ashworth, Member, has contributed the following results of tests made by him with various gas burners on a 2-flue horizontal boiler:

No.	Gas Pressure at Burners in Ounces.	Name of Burner.	Cu. ft. of Natural Gas per hr. per Boiler H. P. Made.
1	0.76	Hoffmann	58.0
2	0.76	Hoffmann	59.7
3	0.34	Reno	67.0
4	0.34	James	63.0
5	2.00	Miller	74.0
6	1.10	Bailey	47.0

Possible Efficiency with Natural Gas.

The foregoing constitute all of the natural gas tests that the writer has made, as well as all available and reasonable tests made by others, although there are many tests published by burner people which are wholly impossible.

The tests here given show that it is not possible to get better efficiency with natural gas than with coal, and prove rather that the best coal efficiences can not be obtained with gas. That is due to the large volume of "air for dilution" which must be supplied with gas burners. On the Cook boiler test, No. 799, the Orsat showed:

7.8 percent of CO^2.
8.05 percent of Oxygen.
0.00 percent of CO.
84.15 percent of Nitrogen.

100.00 percent. Total.

for the composition of the products of combustion at the boiler damper when 72.7 percent of the heating value of the gas was absorbed by the boilers for evaporation.

Such a poor analysis is almost an impossibility with any boiler when burning coal.

To produce a boiler horse-power

$$966 \times 345 = 33{,}327 \text{ B. T. U.}$$

must be absorbed by the water in the boiler. Assume that, on an average, natural gas has 1,100 B. T. U. per cubic foot. Then, if the gas is burned at 100 percent efficiency,

33,327 divided by 1,000=30.3 cubic feet

of gas must be used per horse-power per hour. Yet tests are sometimes reported where from only 17.4 to 19.8 cubic feet were used per hour per boiler horse-power.

Assuming 75 percent to be the best efficiency obtainable with natural gas under boilers (and this is very difficult), then

30.3 divided by 0.75=40.4 cubic feet

of gas, at normal barometer and temperatures, which must be used per hour per boiler horse-power.

Finally.

(1) There is but little advantage possessed by one burner over another.

(2) As good economy is made with a blue as with a white or straw flame, and no better.

(3) Greater capacity may be made with a straw-white than with a blue flame.

(4) An efficiency as high as from 72 to 75 percent in the use of gas is seldom obtained under the most expert conditions.

(5) The "air for dilution" is greater with gas than

with coal, so that possible coal efficiences are impossible with gas.

(6) Don't expect, in good commercial practice to get a boiler horse-power on less than from 43 to 45 cubic feet of natural gas, the same being referred to 60 degrees Fahr. and 4 ounces pressure above a barometer of 29.92 inches.

(7) Fuel costs are the same under best conditions with natural gas at 10 cents per 1,000 cubic feet and semi-bituminous coal at $2.87 per 2,240 pounds.

This is based on 3.5 pounds of wet coal being used per boiler horse-power per hour or 45 cubic feet of natural gas.

(8) Expressed otherwise, a long ton of semi-bituminous coal is the equivalent of 28,700 cubic feet of natural gas; while a short ton of such coal is the commercial equivalent of 25,625 cubic feet.

(9) As compared with hand firing with coal in a plant of 1500 boiler horse-power output, coal being $2.00 per 2240 pounds,—considering labor saving by the use of gas —natural gas should sell for about 10 cents per 1000 cubic feet.

BRITISH ADVANCE RESUMED.

(Special Correspondence.)

Birmingham, Eng., Dec. 21.—Important advances recently declared suggest that the British iron trade has commenced another upward movement. Following the last meeting on the Birmingham Iron Exchange, the ironmasters met at the Midland Hotel and decided to raise the standard for common iron from £6 15s to £7. It is notorious that this latter figure has already been passed in practice and further advances must follow. Finished iron makers are considering whether to abolish the 2½ percent discount usually allowed to customers in view of the recent similar abolition by makers of pig-iron. Steel strip and hoops have been advanced 5s making the standard £7 15s, while gas strip has also been put up 5s, the recognized selling price thus being raised to £7. Pig iron is generally dearer. Northamptons which were recently raised to £2 17s 6d are actually selling this week at £3, generally considered an amazing figure. Although deliveries are most difficult to get in Middlesboro, the stocks in Connals stores continue to increase at the rate of about 1,400 tons a day. The general impression here is that the Americans are manipulating these stores, and that one of these days they will swoop down and take the lot. There is much anxiety by users to renew pig iron supplies.

NEW SOUTH WALES AIDS INDUSTRY.

An effort on the part of the government of New South Wales to build up a local iron industry is reported in the *Engineer and Iron Trades Advertiser* of Glasgow. Referring to the conversion of the Australian Colonies into one great commonwealth, it says:

"One of the most notable movements at this present hour is the efforts which are being made by certain of the governing powers to develop the native industries, and, if possible, create new industries.

"One of the latest steps in this direction is the agreement which the government of New South Wales recently entered into with Messrs. W. Sandford & Co. of Lithgow, whereby the latter have undertaken to establish within the state blast furnaces and all necessary machinery for the making of rolled iron and steel. The conditions of the agreement of contract are that 90 percent of the pig iron must be produced from ore mined in the commonwealth. These conditions are part of a contract to supply the government, the railway commissioners, and the harbor trust with material at a price 6.7 percent higher than the average paid during the past five years.

BOOK REVIEWS.

"Tools of Business."—Edited by E. H. Beach, Detroit, Mich. Bookkeeper Publishing Co., Ltd. 8 x 10¾ inches. Illustrated. Supplied by *The Iron Trade Review* for $2.00.

The title of this book fully describes it. It is devoted to a description of all the devices which may be used in a modern, first-class business office, such as adding machines, typewriters, desks, loose-leaf ledgers, cabinet files, duplicating machines, numbering machines, etc. In addition to describing all these there is presented with each device a list of manufacturers of it, together with a short description of the device as manufactured by each of the different companies. The books should prove a great convenience to any company purchasing office supplies, as practically everything which can be used in an office is listed, and the firms manufacturing these articles may be communicated with at a minimum of labor.

The "Mechanical World" and Year Book for 1906. Emmott & Co., Ltd., Manchester, Eng. 4 x 6 inches. 390 pages. Illustrated. Cloth. Supplied by *The Iron Trade Review* for $0.25.

In the present edition of this well-known annual a large amount of new matter pertaining to engineering practice has been incorporated. A section of 10 pages is devoted to the steam turbine and another section deals with refrigerating machinery, ice manufacture and cold storage, and in this will be found many tables of value in connection with the design of refrigerating plant.

Another section discusses speeds and feeds suitable for high speed steel tools, and in this connection a new and extended table of cutting speeds is given. A new table of factors of evaporation has been introduced and additions have been made to the sections dealing with gas and oil engines.

Fowler's Electrical Engineer's Year Book. Scientific Publishing Co., Manchester, England. 4 x 6 inches. 643 pages. Illustrated. Imitation leather. Supplied by *The Iron Trade Review* for $0.75.

This is the 1906 edition of this well-known and popular engineering hand book. It has been thoroughly revised and brought up to date, and the index has been entirely re-written. A large section on electrical engineering has been added, including the designing of alternating current generators, and another section dealing with steam turbines and turbo-generators. Additional information in previous editions is given on power and cost of electrical distribution. Some notes are also added on insulating materials for electrical machines. The Board of Trade rules for lighting and traction are embodied in the book, and are brought completely up to date, and the new Home Office Regulations for use of electricity in mines are also presented in full. The alterations comprise about 50 pages of entirely new matter, which is independent of the reconstruction of the Directory of Electric Light, Power and Traction Stations which constitutes a distinctive feature of the work.

"The Competent Life", by Thomas D. West, published by the Cleveland Printing & Publishing Co., Cleveland, O., 5 x 7¾ inches., 245 pages, 25 illustrations. Supplied by *The Iron Trade Review* for $1.25.

The author of this work, Thomas D. West, has long been well known to the American public and especially to the foundry industry, as a writer on foundry subjects. When only a small boy his father died and little Tommy had to scratch for himself. He learned the molder's trade and has worked through to an important and lucrative po-

sition. Most of his education has been gained from home study and reading. In the last few years Mr. West has been devoting his leisure time largely to the writing of a series of essays dealing with sociological problems relating to American industries. His training has especially fitted him for seeing the world from an angle from which few writers see it. The present book is the result of these studies as to the present social conditions in this country and how American citizenship can be advanced.

Among the chapters are the following: "Responsibilities of Civilians", "Man's Need of a Boss", "Demands for Intelligence and Skill," "Qualities Necessary to Achieve Success", "Need of Technical Education", "Cause and Extent of Poverty and Pauperism," and many other chapters dealing with American life as it is today. This work will be found of interest by all who are considering these problems, especially on account of the fact that the view point of the writer is somewhat different from that of most writers. In the preface the author states that he claims neither title nor degree and does not seek the appellation of man of letters, but that he does claim to be the bearer of principles, truths and suggestions whereby the development of more competency can be brought about.

"Constructural Steelwork." A. W. Farnsworth, Philadlphia. J. B. Lippincott Co. 6½ x 9 inches. 284 pages. 103 illustrations. Cloth. Supplied by *The Iron Trade Review* at $3.50.

This book, by an English author, treats, as its title indicates, of the construction of steel structures. It is a valuable addition to engineering literature, and contains information which should be in the possession of all designers on this class of work. The book is divided into two parts, headed respectively Practical Designing and Practical Shop Work. In part one a few chapters are devoted to ideal designing and to the governing factor in designing—economy—and the duty of the designer to his client. These three chapters are more in the nature of a sermon than an engineering treatise, but they are well worth reading nevertheless. The engineering matter proper starts at chapter 4, which deals with tests and analyses of the materials used. Chapter 5 discusses the specifications for work and specifications used in the United States are frequently referred to. Three chapters of the book are devoted to the proper drawings to be made for a job. These chapters are especially good, and contain many little kinks and hints for designers by means of which they can save much time and material. Their value is added to by profuse illustrations which indicate the right way and the wrong way to design, a number of given pieces. The three last chapters in part one are devoted to inspection and to estimating. These chapters go into great detail and those engaged in this class of work should make themselves perfectly familiar with them.

Part two, dealing with practical shop work, consists of nine chapters and carries the work through from the office to its delivery. The first chapter is on office routine. A number of forms for order blanks and material sheets are given, which are all calculated to save time when the work reaches the shop. The practice of different shops is compared somewhat, and the advantages and disadvantages of different systems are pointed out. The template shop, the grinder shop and the smithy are all taken up and described in order. The machines which are used in each shop are illustrated and described, and the duties of various workmen in these shops are also discussed The final chapters deal with finishing and shipping, and the general equipment of a steel work shop. The language of the book is somewhat verbose, but on the whole it is an exceedingly useful and practical work.

IRON ORES OF TEXAS.

(Special Correspondence.)

HOUSTON, TEX., Dec. 19.— The most prominent mineral deposit of Texas, and one which has attracted much attention and the value of which has been proven, is that of iron. There are two iron districts in the state, one in eastern Texas, where the formation is of the tertiary period, the other in southwestern Texas—the Llano district—which is archaic.

The iron ore of the eastern Texas district, which extends from about Calvert, in Robertson county, northeasterly to within about sixty miles of Texarkana, is of the formation known as "bog ores." It is the nature of brown hematite ores to occur in pockets, but the peculiarity of the eastern Texas deposit is that it runs in continuous and persistant ledges for many miles, in fact covering the entire mountains of eastern Texas. The strata range from 22 to 36 inches in thickness and are generally 170 feet above the valleys and 500 feet above sea level.

The ores are frequently exposed, and where covered, the stripping is light, so that mining methods are very simple and inexpensive. The ores are described as brown hematite solid, brown hematite laminated, and brown hematite crumbly. By selection it has been demonstrated that these ores are clearly steel making, coming within the Bessemer limit. For foundry use no selection, washing or preparation of any kind is necessary.

The iron ores of eastern Texas were smelted for several years prior to the civil war, in a small hillside furnace in the vicinity of Jacksonville, in Cherokee county. During the war several of these small plants were established to furnish iron for domestic use and for the Confederate Government. That government had arranged to establish large works at Jefferson, but the project was cut off by the termination of hostilities. After the war the plants referred to were operated for a time in connection with foundries where various small articles of iron were made, but with the construction of railroads affording cheaper transportation from the great iron producing centers, these primitive plants fell into disuse.

In 1884 the utilization of the ores was resumed according to modern methods and with something like adequate facilities, when the State of Texas had constructed at the Rusk penitentiary a blast furnace of twenty-five tons daily capacity. This furnace was operated until the summer of 1903, when it was torn down to give way to a larger and more modern plant. During the nineteen years of its existence the little furnace demonstrated the commercial value of the iron ores of east Texas and the practicability of iron making in that region. It afforded material for a very considerable manufacturing industry in connection with the penitentiary system, a large pipe-making plant and foundries being successfully operated. Besides this, large quantities of pig iron were sold to plants in Texas and throughout the west, notably to the car wheel foundries at Marshall and Houston, Texas. The value of the iron for car wheel purposes was early recognized, and the wheels made from it have been popular with the railroads. This twenty-five ton furnace always considerably exceeded its rated capacity.

The new furnace which was completed and blown in in April of the present year, has a rated capacity of 50 tons daily, and is thoroughly equipped and modern in every particular. It was erected out of an appropriation of $150,000 made by the legislature in 1903, for the purpose of extending the iron industries of the penitentiaries. One of the provisions of the act is that tests shall be made in the use of lignite for fuel. The fuel heretofore

used was charcoal. The state has made ample provisions for wood to supply the same character of fuel for many years to come, but it is desired that lignite, large deposits of which exist in Texas, shall be utilized also, if found suitable for smelting purposes.

It is the intention of the penitentiary management to use the bulk of the output of this furnace for making water and sanitary pipe and for foundry purposes in the works at the penitentiary.

In 1891 an eighty-ton furnace was erected at Jefferson, Texas, which is located conveniently to the iron deposits of Marion and Cass counties.

The iron ores in the regions surrounding Rusk and Jefferson have been passd upon by the highest authorities most favorably and the quantity is sufficient to supply scores of works for an indefinite period.

Sample of the Cherokee county ores analyzed by the St. Louis Sampling & Testing Works was shown to contain the following:

Moisture	1.63
Loss by Ignition	11.85
Silica	10.81
Alumina	3.40
Metallic Iron	48.24
Manganese	0.43
Lime	0.24
Magnesia	Trace
Sulphur	1.175
Phosphorus	0.258

Samples of the Marion and Cass county, ores analyzed by Edgar Everhart, Ph. D., professor of chemistry, University of Texas, were shown to contain the following, respectively:

No. 1 Contains.

	Percent
Phosphorus	0.04
Sulphur	0.02
Silica	6.83
Metallic Iron	61.38
Oxide of Iron	87.69

No. 2 Contains.

	Percent
Phosphorus	0.19
Sulphur	0.23
Silica	6.83
Metallic Iron	57.44
Oxide of Iron	82.06

A fifty-ton furnace erected at New Birmingham, two miles from Rusk in 1890, and another furnace of the same capacity between Rusk and New Birmingham, erected in 1891, were operated for a short time, but are not now in operation. It is believed that the steps taken by the state for manufacture of iron with adequate and modern facilities, and the experiments to be conducted at its plant in Rusk, will have an important influence in promoting the extension of the iron industry throughout the eastern portion of the state.

In the Llano district, which is rich in many minerals, is one of the most wonderful deposits of iron ore within the United States. It is of the magnetite or specular variety, and bears an unusually high percentage of metallic iron. It is said to be as fine as any iron ore in the world.

This iron is found throughout Llano county and the eastern part of Mason county. The formation is probably fifty miles long and thirty to forty miles in width, the trend of the iron veins being from northwest to southeast. The iron outcrops in numerous places, probably the most prominent outcrop being that at Iron mountain, where many thousands of tons of ore are exposed. Some development work has been done there, reaching a depth of fifty feet, with cross-cut through a clean body of iron ore fifty feet in width. There has been development at several other points. Shipments of the ore have been made at several times to furnaces in the Alabama and Pittsburg districts, and also to the furnace at the Rusk penitentiary, where it has been satisfactorily used. It is probable that it may be used in the new furnace at Rusk in connection with the hematites of that district.

Comparative analyses of Llano ore and Lake Superior ore:

Llano ore.		Lake Superior ore.	
Iron.	Phos.	Iron.	Phos.
66.90	0.023	64.10	0.040
64.15	0.014	64.06	0.027
68.67	0.027	65.20	0.038
71.15	0.008	65.45	0.048
70.16	0.001	62.55	0.061
67.83	0.020	62.50	0.045
71.27	0.018	61.60	0.067
70.26	0.014	60.10	0.055
68.10	0.021	67.55	0.041
69.17	0.009	62.58	0.040
68.82	0.038		
Aver. 68.77	0.017	Aver. 63.579	0.462

An examination of the above shows:

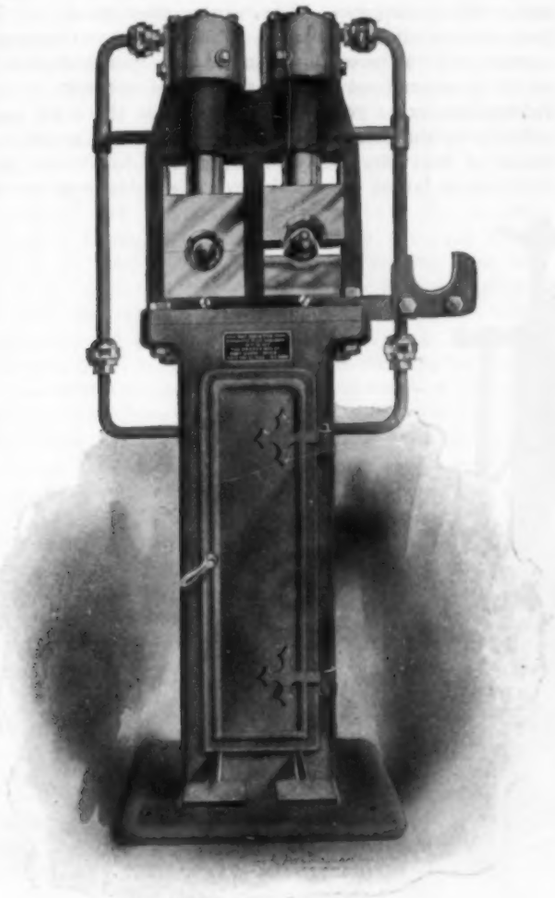
That the Llano ores are richer in metallic iron than those of any of the Lake Superior regions; that the percentage of phosphorus is exceedingly small, and so far below the Bessemer limit as to establish beyond doubt the utility of the ores for steel making by the ordinary or acid process; that the element of silica enters into the composition of the ores only in a very low percentage.

Everything necessary for the production of iron in the Llano district is found there with the exception of coal. There is plenty of limestone for fluxing purposes, and there is excellent water power. There is also an abundant supply of manganese available for spiegelizing in the manufacture of Bessemer steel. Railroad facilities are limited, there being but one railroad in the district at the present time, and the problem of transporting fuel to the ores, or ores to the fuel, is yet to be solved. Several propositions have been considered for the utilization of the iron on a considerable scale: First, the shipment of the ore to Galveston by water, and thence by rail to smelters on the Atlantic seaboard; secondly, the concentration of the ores from the Llano district and those from eastern Texas at Galveston and Houston where they would be smelted with coke brought to those points by water; and third, the smelting of the ore in the Llano district in the event of the construction of a railroad communicating directly with the coal fields of northern Texas and Indian Territory. None of these plans have yet been realized, but with the rapid extension of the railway system of Texas, it is believed that before many years have passed, the transportation facilities will be such that this valuable deposit of iron ore will be utilized.

Rolling Mills Consolidate.—The Shenango Iron & Steel Co., recently organized with a capital of $300,000, takes over the mills operated by a company of that name at Wheatland, Pa., to which will be moved the mills of the Independent Rolling Mills Co., Cuyahoga Falls, O. Finished bars, skelp and muck bars will be manufactured. The president of the company is John C. Bole of Pittsburg; H. A. Ross of the Bole-Ross Co., Pittsburg, is vice president and general sales agent; A. W. Herron of Pittsburg is treasurer and other directors are Samuel McClure of the Stewart Iron Co., Sharon, Pa., W. D. McKeefrey of Leetonia, O., and Mason Evans and William Wilffok of Youngstown. William S. Roberts of Sharon is superintendent and will have full charge of operating the mills.

MCGRATH PNEUMATIC FLUE WELDER.

The Draper Mfg. Co., Port Huron, Mich., builds the McGrath pneumatic flue welder for the welding and scarfing of flues. This is shown in the accompanying illustrations. The machine consists of a double cylinder pneumatic hammer set on a base. The frame of the double cylinders is a single steel casting. The piston is made of solid steel, hardened and ground to fit the cylinder. It is 4 1-16 in. diameter at its largest dimension and is tapered



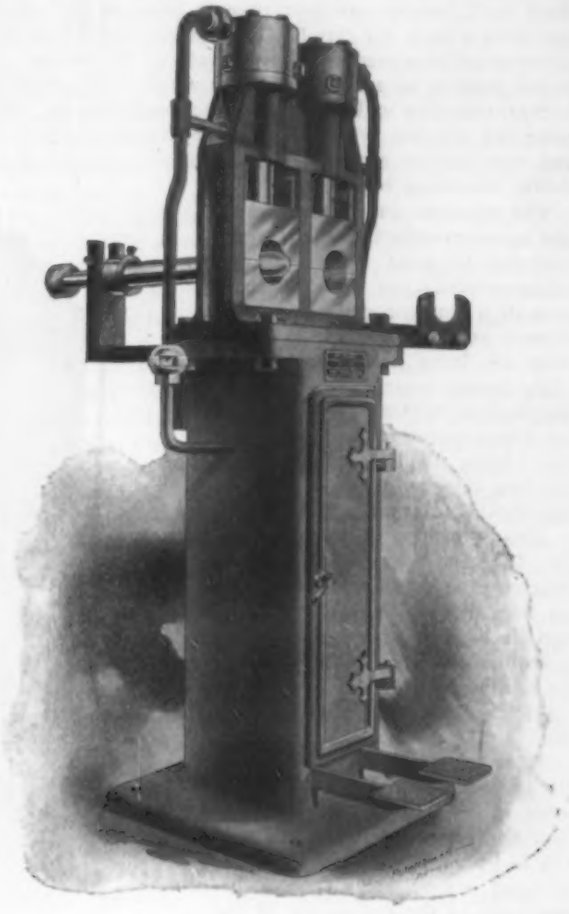
MCGRATH PNEUMATIC FLUE WELDER.

6 degrees on each side, leaving it parallel to the cylinder sides for a distance of 1½ in. Below the head the piston is shouldered to 2⅝ in. It is attached to the top die at its lower end, being held in place with a key. The lower die is held rigid in the steel frame.

The dies are bored to the outside dimension of the flue with an allowance for expansion when hot. The mandrel is nearly the size of the inside of the tube, and is provided with a collar to suit in length of the swage ends required

Air is admitted to the machine through a ¾-in. pipe, which is connected to the valve box on the inside of the base. The valve box is provided with two independent valves which connect with a foot lever at the side of the machine. This works independently so that while welding is being done the side used for scarfing is idle, and vice versa.

To operate the hammer it is only necessary to press the foot lever. Air is then admitted through the side pipe underneath the shoulder of the piston, forcing it to the top of the cylinder and pushing back the small valves which project into the cylinder. These valves admit air above the piston, and as its area is larger than that of the shoulder underneath, the piston is driven downward until the dies come together. A 1-in. hole extends from the top of the piston to the small port holes in the rod which is above the die. Exhaust occurs through these holes when they come below the cylinder. When the blow is delivered the piston is carried upward by the air pressure which is always acting underneath the shoulder of the piston when the foot valve is open.



MCGRATH PNEUMATIC FLUE WELDER.

The pistons will deliver 2,000 blows or greater per minute with 100 lb. air pressure. The top die and the piston together weigh about 40 lb., and the hammer will strike over 33 40-lb. blows per second, a number which is sufficient to weld a flue.

The frame of the machine is made large enough to allow the dies to be bored out so as to weld any size of flue up to 4½ in. By using a long mandrel and placing the welder behind the furnace and allowing the flue to project through the dies there is no limit to the length of end which may be welded.

ACTIVITY AT SYDNEY.

The Sydney iron and steel industry continues very active. Between Staurday night, Dec. 16, and Monday morning 36 car loads of iron and steel products from the Dominion Iron & Steel Co. Works and 30 car loads from the Nova Scotia Steel Co., left Sydney for Western point. The shipments aggregated 4,000 tons.

LIDGERWOOD IMPROVED ERECTING MACHINE.

The accompanying illustration shows the latest type of Lidgerwood hoisting engine which is largely used in bridge erection work as well as in the construction of iron buildings. It is equipped with winches or spools instead of drums on account of the large amount of rope usually to be wound in this class of work and the fact that with the winch or spool the quantity that can be taken care of is practically unlimited.

The spools are all keyed fast to the shafts, which are independent and supported by a central bearing. Each spool-shaft, has its own gear running loose on the shaft and fitted with a jaw clutch. The jaw clutches are of the Lidgerwood improved spiral type, and can be thrown in at any position by small hand levers which have thumb-latches, engaging with notches on the quadrants, so that when the clutches are thrown in they cannot come out, and when thrown out there is no danger of their accidently becoming engaged.

The absolute independence of the spools enables the engine to be operated to great. advantage in bridge erection, as several members of a truss or girder can be hoisted and held in position while they are being bolted or riveted.

By having several men at the engine these members can be hoisted simultaneously, the number in fact being limited only by the hoisting capacity of the engine and the number of spools.

Also by making fast to each end of a long and heavy girder, and by hoisting first on one end and then on the other much greater weight can be handled than by means of a drum hoist. The tackle can also be multiplied as much as desired, since any amount of rope can be wound on the spools.

This engine is epecially well proportioned for the severe cha-acter of hoisting. duty it has to perform. It will be noticed that the bed-plate is in one piece, and widened in front so that the working parts of the engine are all inside the side frames of the engine. This leaves the winches clear so they can be operated without danger to the men handling the lines.

The shaft bearings are wide, and the shafts themselves are of the best hammered steel and unusually large, to withstand the stain due to handling heavy weights on the overhanging spools.

The gearing is extra strong and heavy and. the engine can be operated from either side.

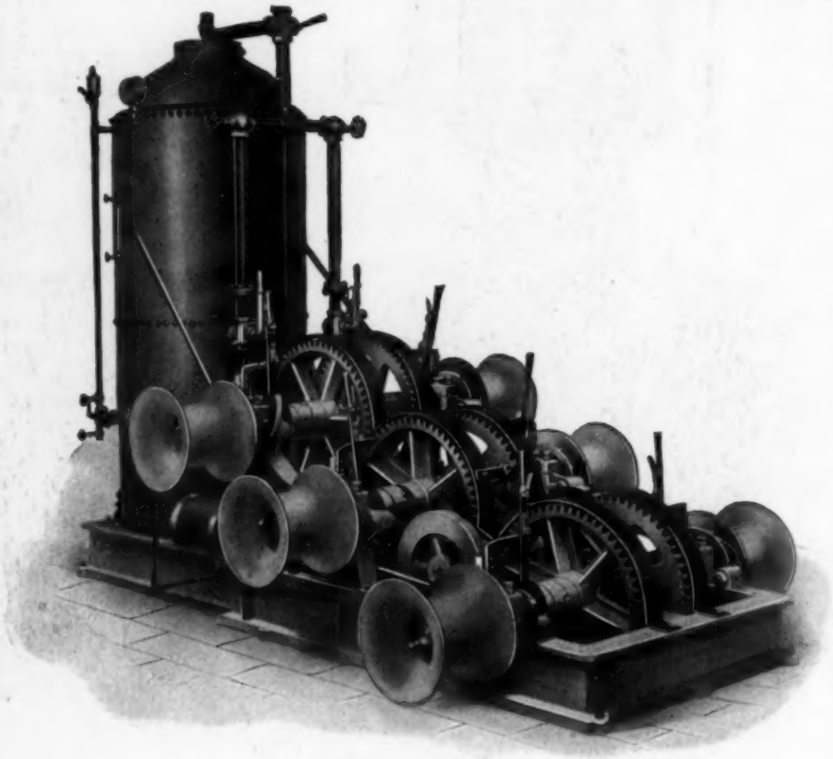
An important element in the success of this engine lies in the form of spool, which is especially adapted to the class of work for which the engine is designed to be used.

If desired the engine can be epuipped so as to be self-propelling in either direction.

Japan's progress toward industrial independence, writes Consul Sharp from Kobe, has reached a point where the simpler kinds of machinery, electrical apparatus, railway cars, excepting the trucks, bicycles, stoves, tools and hardware of varied designs are now manufactured locally.

FREE RENT FOR AUSTRIAN WORKINGMEN.

Austria is making great progress in the housing of its workmen, according to a report forwarded to the American consular authorities by our representative at Chemnitz. He describes the operations of the Wienerberger brick-making establishment at Vienna which has built homes for about 2,500 families. "These houses", he reports, "are placed at the disposal of the workingmen free of rent. The company not only lets the homes free of rent, but also delivers gratis the necessary fuel for heating and cooking purposes. The workingmen must pay for their own furniture and light. This very liberal system is applied only to the workingman and his immediate family, which is understood to consist only of the wife and all children under 14 years of age. In case there are many children in the family the parents of the workingman or those of his wife may wait upon and look after such children as far as the local laws governing overcrowded tenements or flats will permit.



LIDGERWOOD ERECTING ENGINE.

"This system of housing workingmen, however, forms a part of their wages and the moment a workman leaves the employ of the company he must vacate, together with every member of his family, the dwelling which he has occupied during the period of his employment. The children of workingmen holding independent positions outside of the company's works are not permitted to live with their parents in any part of of the dwellings without paying a weekly rental of 20 cents per capita. This sum is regularly deducted from the father's wages. The rules in this respect are very strict. It is sufficient cause for dismissal if the head of the family attempts to dodge these provisions by even inviting some of his next of kin or some visitor to remain over night. Each and every workingman living in such a dwelling belonging to the company is compelled to keep the living rooms, kitchen, cellar and outhouses in a state of absolute cleanliness and to have them aired daily."

EDUCATION OF APPRENTICES.

Extensively Discussed at Meeting of the Cincinnati Metal Trades Association.

The regular quarterly meeting and dinner of the Cincinnati Metal Trades Association, held in the banquet hall of the Business Men's Club, Dec. 20, was devoted chiefly to the consideration of the question of the education of apprentices. Fred Geier of the Cincinnati Milling Machine Co. reported that the special committee recently appointed to investigate the apprenticeship question and the matter of taking care of advanced pupils desired time for further consideration and sought expressions of views from members of the association. He called attention to the fact that in a large shop the foreman is chiefly interested in the output and with his time thus occupied in seeing that his men turn out the necessary amount of work he has but little opportunity to look after the instruction of apprentice boys. He urged that a better place than the shop be provided for the education of apprentices and advocated liberal support to the Ohio Mechanics Institute and the providing of night school facilities for boys. A "shop-school" building was suggested, to be in all respects a complete shop equipped with the same tools and machines as are used in actual manufacture of machinery. Each department should be in the charge of a practical man with the idea of making the instruction entirely of a practical nature. Foundry work and other lines of manual training might be included.

Mr. Geier was followed by Prof. Herman Schneider, C. E., of the University of Cincinnati, who spoke on "Cooperative Education."

The "Engineering Temperament".

Discussing the "raw material," the young man entering an engineering college as a student, Professor Schneider declared that his efficiency after graduation would depend on three elements, a robust and vigorous body, an equally robust and vigorous mind properly trained and "engineering temperament," the last named a factor of prime importance rarely considered and exceedingly difficult to discover.

"Certain men are 'cut out' to be engineers. An effort should be made to obtain these men. The writer does not think that all raw material which presents itself and passes certain mental examinations ought to be accepted; nor does he believe that the process of elimination by examination during the college course leaves a residue of the best material obtainable. He advocates the adoption of a system which will secure as nearly as possible such raw material as will, when properly prepared, make the desired finished product of the school."

"To make technical men who will more nearly meet the requirements of the new industrial conditions and to select the proper raw material, the following plan of Cooperative Education is proposed:

"The owners of the Metal Trades industries will send to the College of Engineering of the University of Cincinnati their brightest young men who possess a natural mechanical aptitude. These young men will work alternate days at the University and at the shops. They will be sent in pairs alternating with each other so that when one young man is at the college the other is at the shops, thereby entailing no financial sacrifice on the owners of the shops. The course will probably cover a period of six years. Such young men as are not prepared to enter the University will prepare at the Ohio Mechanics' Institute or wherever feasible in the night courses. Young men who finish the University course will be given the technical degree of Mechanical Engineer. The University will make the course sufficiently elastic to permit the training of young men for pre-determined positions. For instance, if it is desired to train a young man for the position of salesman, his course will be modified to enable him to take up such special subjects, as the employer may suggest.

Can Meet Their Own Expenses.

"The young men selected will be paid half time by the shops inasmuch as they work half time, unless the shop owners desire to make a more liberal arrangement. This will enable the student to pay his college expenses and, if he works every day during his college vacations, to save a small sum additionally. For deserving young men who have to meet all their personal expenses, such as board and lodging, or who must help support a family, some other provision must be made. It will be necessary to raise a fund from which such men could borrow on their personal notes enough to enable them to finish the college course. After graduation, when they are receiving the higher wages of highly trained men, they can easily meet the debt in a year or two.

"The University expects further to offer night courses in higher technical work, and also in shop accounting, cost keeping, etc."

Prof. J. L. Schearer, superintendent of the Ohio Mechanics' Institute, declared that the great need of the shops was practical machinists rather than highly educated technical men. He sought further equipment for the new school building to accomodate additional pupils, 820 being already enrolled in the night schools.

President Dabney's Address.

President C. W. Dabney of the University of Cincinnati compared conditions of technical education abroad with those of the United States. In England, he said until recently the idea was that the shop was the proper training school for the boy but that this was giving way to the idea of a higher technical collegiate education. Schools in the United States, he declared, were paying too much attention to theoretical instruction. The varied industries of Cincinnati he pointed out as affording particular opportunities for cooperation between the manufacturer and the educator and he endorsed Prof. Schneider's plan for the student to work part time in a shop and part in the university. He advocated the secondary schools for the ordinary artisan and the technical school for such men as developed exceptional aptitude in some particular line.

J. H. Cone, assistant secretary of the National Metal Trades Association, discussed the subject of merging the local associations into the national body and reported the consolidation idea as increasing in favor in the East. Mr. Stanwood of the Huston-Stanwood & Gamble Co., referred to the school which his company has started in connection with their shop for the education of apprentices, special teachers being employed with every prospect that the experiment would prove a success. Mr. Huston of the same firm declared the instruction of apprentices was usually along narrow lines and advocated liberal compensation for shop foremen and superintendents. Walter Laidlow, of the Laidlow, Dunn Pump Co., endorsed the work of the Ohio Mechanics' Institute.

Time Is All Important.

William Lodge of the Lodge & Shipley Machine Tool Co., spoke of the element of time as all important to the manufacturer. He declared that the successful men in that branch of industry have gained their positions through their knowledge and experience in the training of men especially with the idea of time saving and intelligently directed effort.

The discussion was concluded by superintendent Chase of the Cincinnati Milling Machine Co. who related some experiences of his apprenticeship. He was of the opinion that the highly technical education was not essential but that if the boy was taught to be useful, of good habits, dexterous and was in possession of mechanical ability he would develop himself if he possessed a good common school education.

NEWS FROM MANY INDUSTRIES.

New Buyers:—

The Mt. Vernon Bridge Co., Mt. Vernon, O., has decided to increase its capital stock from $100,000 to $200,000.

The Illinois Corrugated Metal Co., Bloomington, Ill., has been incorporated with a capital of $10,000 by William B. Belt, Clifford B. Voris and Flora M. Voris.

The Syracuse Malleable Iron Works, Syracuse, N. Y., has been incorporated with a capital stock of $50,000 by W. B. Burns, Lyman Smith and Basil B. Ayuesworth, all of Syracuse.

The Mound City Boiler & Sheet Iron Works., St. Louis, Mo., has been incorporated with $11,500 capital stock by William Koch, Charles J. Devlin and Theodore Hemeimann Jr.

The Hancock Mfg. Co., Chicago, has been incorporated with $2,500 capital stock to manufacture machinery. The incorporators are: Frederick H. Hancock, Harry W. Hancock and I. E. Hancock.

The Waterman Car Wheel & Foundry Co., Houston, Texas, has been incorporated with a capital stock of $50,000 by G. H. Hermann, W. H. Waterman, A. J. Binz and J. J. Seetegast Jr., all of Houston.

The Cape Ann Tool Co., Rockport, Mass., has been incorporated to conduct a foundry. The capital stock is $16,000, and the officers are: President, William H. Hastings, Malden, Mass.; treasurer, J. J. Dean; and clerk, F. S. Morse, both of Rockport, Mass.

The Wolfsmouth Tool & Specialty Co., New York, has been incorporated to manufacture machinery, tools etc. The capital stock is $5,000 and the incorporators are: Richard Moldenke, Watchung, N. J.; Frederick R. Morse, 83 St. James street, and Frederick C. Bonny, 36 Ormond Place, Brooklyn.

The E. T. Kimball Co., New York, has been incorporated with a capital stock of $10,000 to manufacture motors. engines, etc. The incorporators are: William R. Betys, 104 West 143rd street; Carlyle J. Gleason, 55 East Sixty-fifth street, New York; and Henry T. Randall, 255 Central avenue, Orange, N. J.

The Shepherd Steam Turbine Co., Salt Lake City, Utah, has been incorporated to manufacture steam turbines under the patent recently secured by Frank D. Shepherd. The company is capitalized for $100,000. The officers are: Frank D. Shepherd, president; C. M. Chandler, vice president, and C. B. Jack, secretary and treasurer.

The Miners' Foundry & Supply Co., Joplin, Mo., has been incorporated with $50,000 capital stock. The following officers have been chosen: President, H. C. Cole; vice president, Paul N. Davey; treasurer, W. B. Kane; secretary, C. P. Wallace. The board of directors is composed of H. C. Cole, W. B. Kane, George Hardy, George W. Moore, H. Tamblyn, Paul N. Davey, Dr. H. Gundling, Col. D. Dwyer and E. Bendelari.

C. S. Koch, formerly with the American Steel Foundries, and others have applied for a charter for a company under the name of the Fort Pitt Steel Casting Co., for the manufacture of small steel castings. Plans for the building have been completed and erection will start immediately. A site has been leased at Christy Park, near McKeesport, Pa., on the Baltimore & Ohio Railroad. At the start, about 50 men will be employed.

The Ericsson-Eddy Co., Port Chester, N. Y., has been incorporated to manufacture hardware with a capital of $25,000. The incorporators are: Alfred Ericsson, Henry A. Eddy, Port Chester, N. Y.; and William A. Williamson, New York.

The Empire Specialty Tool Co., Manhattan, N. Y., has been incorporated to manufacture hardware, iron and steel products with a capital of $100,000. The incorporators are: Edward D. Woods, New York; William A. Hyle, Syracuse, N. Y.; Gustav A. Lanske, New York; Edson F. Slack, Syracuse, and Clara Lanske, New York.

The Fairfax United States Mail Chute System, Manhattan, N. Y., has been incorporated to manufacture mail chutes, mail boxes, etc. The capital stock is $250,000 and the incorporators are: Victor M. Pazimo, Brooklyn; G. E. Springsteen, Jersey City; L. Breitigain, Edwin F. Nautty, Alfred H. Thurston, New York; and A. H. Washington, Philadelphia, Pa.

The Telegraph Signal Co., Rochester, N. Y., has been incorporated to manufacture telegraph instruments, railroad signals etc. The capital stock is $1,000,000 and the incorporators are: James G. Haileran, John McGarvey, Rochester; Menzo J. Storer, Henry Billings, Morton; and Othello A. Huff, Kent.

The Hector Submarine Boat & Propeller Co., Newark, N. J., has been incorporated to manufacture and repair submarine ships, boats, vessels, etc., with a capital of $100,000. The incorporators are: Andre Hector, East Newark, N. J.; Ludwig F. Margot, Newark, N. J.; and John W. Reid, Kearny, N. J.

The Eberhardt Bros.' Machine Co., has been incorporated with addresses at 66 Union Street, Newark, N. J. The company will act as mechanical and electrical engineers, machinists, etc. The capital stock is $70,000 and the incorporators are: Henry E., Henry J., Elmer G., and Frank E. Eberhardt, all of Newark, N. J.

The Wilkins' Coal, Iron & Lumber Co., 1025 Market street, Camden, N. J., has been incorporated to mine coal, gas, oil, etc. The capital stock is $125,000 and the incorporators are: George A. Pridham, 724 North Fortieth street; Robert E. Deady, 832 Fernon street; William J. Wilkins, Marshall Piedham, 1345 Arch street, all of Philadelphia, Pa.; and J. Harry MacFarland, Camden, N. J.

New Construction:—

The Weaver Coal & Coke Co., Chicago, has prepared plans for the erection of 500 coke ovens on the Daddy's Creek property on the Tennessee Central Railroad, in Tennessee, to be known as its Central Coke Plant. Work has been started on 100.

The Coes Wrench Co., Worcester, Mass., will install a large amount of special machinery in its new addition 42 x 50 feet. The company manufactures wrenches and machine knives and the new part will be used as an addition to the knife shop, conducted as the Loring, Coes & Co., Inc.

The Otis Elevator Co. has purchased a tract of land in the Kensington section of Buffalo, N. Y., lying between East Delavan avenue and Ferry street. It is reported that the land will be used as a site for a large plant. It is said that negotiations are also on foot with a view to the purchase of the Howard Iron Works.

The McKerahan Automatic Car Coupler Co., Wilmerding, Pa., recently organized to manufacture its car coupler, is planning for the erection of a plant which will be located near Pittsburg, the site for which has not yet been chosen. The steel foundry will be 50 x 150 ft. The officers of the company are: C. A. McKerahan, president; William McDwett, treasurer and W. W. Brush, secretary.

W. & A. Fletcher, engine builders, Hoboken, N. J., are erecting an addition at the south end of their main ma-

chine shop. The structure will add 100 feet to the length of the building and will be used for some of the larger operations of the plant. A very large boring mill is to be installed, and besides a large lathe, several other machines, including planers, etc.

The McClintock Co. reports that it intends to erect a plant at Hartford City, Ind., during the coming summer and will manufacture the Morris crude oil engines.

The Stanley Electric Manufacturing Co., Pittsfield, Mass., is planning the erection of an iron foundry on the site recently purchased. The structure will be 200 x 400 feet.

Cammell, Laird & Co., Sheffield, Eng., have just completed their new armor plate rolling mill, the largest of its kind in the world. The roll-housings, the rolls and the live roller gear were made by the company and the driving engines of 14,000 h. p. by Davy Bros., of Sheffield.

General Industrial Notes:—

Furnace D, of the Colorado Fuel & Iron Co., at Pueblo, was recently forced to shut down for a few days on account of the frozen condition of ore in the cars.

An explosion at the Deseronto Iron Works, Deseronto, Ont., Dec. 15, wrecked the engine room and engine and compelled the closing down of the plant for repairs.

The Potter Mfg. Co., New Brunswick, N. J., recently incorporated, will manufacture a special design of engines for boats on which Mr. F. J. Potter has been experimenting for several years.

The Avery Co., Ltd., of Birmingham, Eng., which has been in operation there for 167 years, will, according to persistent reports, establish a large scale manufacturing plant at North Milwaukee

On application of controlling directors, Charles E. Duston has been appointed receiver for the Hartford Foundry Corporation, Hartford, Conn., and it is reported that the business of the concern will be wound up. Assets are expected to equal the liabilities.

The Chattanooga Blast Furnace Co., Chattanooga, Tenn., will have its new stack ready for operation within a few weeks. It will be modern in every way, with a skip hoist erected by the Brown Hoisting Machinery Co., Cleveland, and a capacity of 150 tons daily. John Downing is the superintendent.

The Omega Steel & Tool Co., Ansonia, Conn., has purchased the trade marks and other assets from the receiver of the Omega Steel Tool Co., of New Haven, has equipped a plant with all necessary machinery and will have its products on the market by Jan. 1. High speed twist drills, milling cutters, reamers and like tools will be manufactured.

The Sandstrom Short-Turn Buggy Co., Indianapolis, expects to begin the operation of its plant about the first of the year and build about a thousand rigs this season. Most of the necessary power and machinery has already been arranged for; metal parts will be purchased. The short-turn gear, with a fifth wheel on both front and rear axles, connected and working automatically, allows the turning of a double rig in a 12-foot alley.

At the recent annual meeting the Simplex Railway Appliance Co., which will shortly take possession of a large plant being erected just outside Montreal, Can., elected the following officials: W. V. Kelly, Chicago, president; W. W. Butler, N. Y., vice president; R. P. Lamont, Chicago, second vice president; G. E. Scott, Chicago, third vice president; A. H. Cahse, Montreal, secretary; O. A. Lamont, treasurer. The president, vice presidents and Geo. McAvity, of St. John, N. B., are directors.

The New England Boiler Co., recently incorporated under the laws of Massachusetts for $200,0000, is planning the erection of a plant of 60 x 200 feet at Mystic, Conn. When in full operation it will have a capacity of from 10 to 15 boilers daily from designs of Frank A. Hazard, president of the company. Wm. H. Page, its treasurer, was for 25 years manager and treasurer of the Wm. H. Page Boiler Co., of Norwich, Conn.

President John I. Beggs, of the Milwaukee Electric Railway & Light Co., says that the company will have to discard the machinery installed in its power plant about four years ago and erect an entirely new plant of 100,000 kilowatt capacity. It is figured that there has been a depreciation of fully 66 per cent on the investment in machinery of four years ago because inventions and improvements made since that time.

The board of United States general appraisers has made the customs decision that old worn iron chains are properly dutiable at the rate of $4.00 per ton as scrap material and are not entitled to free entrance as claimed by the importers. Broken steel rails are held dutiable under the provision of the Dingley tariff for T rails at the rate of seven-twentieths of a cent per pound. The importers sought a rate of $4.00 a ton.

The Banwell Hoxie Wire Fence Co., recently incorporated at Hamilton, Ont., for $100,000 for the manufacture of wire fencing, has purchased a site in that city and has under construction a factory which will be ready for operation early in the year. H. Banwell, manager, was until recently associated with the McGregor, Banwell Fence Co., of Walkerville, Ont., as president and an active figure in its management. With him in the new company is Vernon Hoxie, lately superintendent of the Lamb Wire Fence Co., of Adrian, Mich.

The Hub Machine & Tool Co., Philadelphia, has removed its office, shop and warehouse to 621-3 Cherry street, where it will have 8,000 feet of floor space available for its rapidly increasing business.

The International Power Co. has secured the manufacturing rights for the Wilkinson steam turbine both for marine and stationary work. The 7,500 h. p. unit now under construction at Providence will be tested about Feb. 1.

Princess Furnace of D. S. Cook & Son, Glen Wilton, Va., has been making record runs since Sept. 1. During the week ending Oct. 27 the production was 365 gross tons; Nov. 3, 381 tons; Nov. 10, 398 tons; Nov. 17, 389 tons; Nov. 24, 392 tons; Dec. 1, 389 tons, and Dec. 8, 395 tons. The usual capacity is only about 50 tons per day. All the ore used was mined on the furnace's own property, requiring on the average 2,495 pounds of New River coke per ton, and yielding about 47 percent. The quality of the iron during these seven weeks did not fall below No. 2 plain.

The American Production Co., Reynoldsville, Pa., recently taken over by the Pittsburg Industrial Iron Works, Westinghouse Bldg., Pittsburg, has been put in operation, the foundry turning out about five tons of iron per day and the brass foundry casting every other day. The new company in control is designing contractors' and rolling mill machinery.

The Pittsburgh Cold Rolled Steel Co., which has been reorganized, has been granted a charter at Harrisburg, Pa. The plant, which has been partly in operation for the past six months, is located at Thirty-ninth and Junction Railroad, Pittsburg. Two pair of rolls are now running fully, and additional improvements will be added within a short time, the building being large enough to accommodate machinery for enlargement to twice or three times the present capacity. The company will make tool steel, soft drawing steel and spring steel. The directors are E. B. Clarke,

James H. Willock, J. W. Kinnear and W. H. Hegmann, of Pittsburg; A. G. McKenna, Braddock, Pa., and Austin A. Wheelock, of Boston.

Albert M. Allen, consulting engineer with a specialty of mills, factories, power plants, heating and ventilation and special machinery designing, has removed his office to 1130-4 Scofield Bldg., Cleveland.

The Besser Mfg. Co., Alpena, Mich., has purchased the foundry of C. B. Warren in that city. It will make a number of improvements to enlarge its capacity in its specialty of marine repair work.

Belgium's trade with China, which last year exceeded $3,000,000, was almost entirely in iron, steel and manufactured products. Wrought iron made up 35 per cent.

Consul Lyon of Monrovia reports the need of motor boats for river and coast traffic in Liberia.

Fires:—

The foundry of the Milwaukee Steel Casting Co., Milwaukee, Wis., sustained a loss of about $5,000 through fire Dec. 14, when the second and third floors of its building, devoted to storage purposes, were gutted by flames.

In the fire which visited the plant of the Pittsburg Gauge & Supply Co., Pittsburg, recently, the contents of only one floor were destroyed, with a loss of $35,000, fully covered by insurance. The plant is again under roof and is running almost to full capacity.

The Standard Metal Furniture Co., Detroit, was almost completely destroyed by fire Dec. 14, the loss being about $30,000. The plant will be rebuilt.

The machine shop of the Stuart Machinery Co., Winnipeg, Man., was partially destroyed by fire Dec. 14, when damage to the extent of $10,000 was incurred.

The Carbon Steel Co., Pittsburg, has repaired its machine shop recently destroyed by fire, so as to tide over the winter months. It is intended, however, to erect a new machine shop during the coming summer.

The plant of the American Sewer Pipe Co. at East Liverpool, O., was destroyed by fire Dec. 21, with a loss estimated at between $75,000 and $100,000. The building was a large, three-story brick.

The Continuous Rail Joint Co. plant at Burden avenue, Troy, N. Y., sustained a fire loss of more than $3,000 on Dec. 16. The roof was badly burned and timbers in the interior destroyed. Work was suspended about 24 hours.

The building at South Carver, Mass., occupied by the Ellis Foundry, was destroyed by fire with a loss of $10,000 on December 19. The building was the property of Peleg MacFarland.

Trade Notes:—

The Lake Superior Corporation recently closed contracts with the Canadian Pacific for 60,000 tons of steel rails deliverable next year. Its capacity is practically all taken for 1906.

The Bourne-Fuller Co., Cleveland, announces the opening of an office at 1126 Frick Bldg., Pittsburg, through which it will be able to keep in closer touch with the mills executing its orders and contracts.

The General Electric Co. is building at its works at Schenectady, N. Y., and Lynn, Mass., a number of Curtis steam turbines totalling 600,000 h. p. In all the company has sold $10,000,000 worth of turbines.

The General Electric Company has secured the contract for electrifying one of the lines of the Pennsylvania Railroad Co. from Philadelphia to Atlantic City. Included in the contract is the necessary power station equipment which calls for Curtis turbines and cars fitted with Sprague-General Electric multiple-unit control.

The Duluth, Mesabi & Northern Railroad has contracted with the Continental Bolt & Iron Works, Chicago, for 300 tons of bolts, washers and spikes to be used in the construction of its ore dock which is being built at Duluth, Minn., at a cost of $1,000,000. The Great Northern Railroad Co. has let a similar contract to the same works for its ore dock at Allouex, Wis.

The Ajax Mfg. Co., Cleveland, is building two 5-in., two 3½-in., three 2½-in. and several smaller forging machines for the Pressed Steel Car Co. A short time ago the company shipped a 6-in. forging machine to the American Car & Foundry Co., one to the Pennsylvania Steel Co. and two 4-in. machines to the Palace Car Co., Chicago. The company has orders on its books for 15 large tools for England, Germany and Russia.

The Westinghouse Electric & Mfg. Co., Pittsburg, is to install motors at the 120-stamp mill and mine of the Peregrina Mining & Milling Co. The company has recently booked orders for about 50 alternating current induction motors to be used in Guanajuato, Mexico, and on the circuits of the Guanajuato Power & Electric Co. The San Prospero Mining & Milling Co. will receive part of these motors, the total capacity of which is from 1,000 to 1,500 h. p.

The Brown Hoisting Machinery Co., Cleveland, has contracts for considerable ore and fuel handling machinery. For the New Jersey Zinc Co., Hazzard, Pa., it will build two furnace hoist outfits and one for the Alabama Consolidated Coal & Iron Co., Birmingham, Ala.; for the Republic Iron & Steel Co., Youngstown, a 7½-ton bridge, bins, furnace hoists, etc. and for the Federal Furnace Co., South Chicago, two large bridges, bins and conveying machinery.

The Macbeth Iron Co., Cleveland, is now erecting one of its blowing engines at the plant of the Genessee Fce. Co., Charlotte, N. Y. This engine has steam cylinder 42 inches in diameter, an air cylinder 84 inches in diameter and a stroke of 54 inches. This engine is practically ready for operation. For the new furnace to be erected by the Josephine Fce. & Coke Co. at Black Lick, Pa., and to be controlled by Corrigan, McKinney & Co. of Cleveland, the Macbeth Co. will erect three blowing engines all with 44 and 84 inch cylinders and 60 inch stroke. They are to be of exceptionally heavy design and construction.

Cement Convention Changes.—The National Association of Cement Users' convention will be transferred from Milwaukee, Wis., to Columbus, Ohio, owing to the burning of the Exposition Building at Milwaukee. As 10,000 square feet was required for the exhibits of the association, this fact made it difficult to secure adequate quarters. Columbus was finally selected. As the Governor's inaugural ball will be held on the 8th inst., the dates of the convention have been advanced one day, thus making the convention dates as they now stand from the 10th to the 13th of January inclusive. It was not an easy proposition to secure adequate quarters as the exhibits of machinery, cements etc. at the convention will be usually large.

Claim of the Iron Molders.—The *Iron Molders' Journal* in its current issue takes exception editorially to the statement of Commissoner Briggs before the N. F. A. that the Iron Molders Union has decreased in membership close to 50 percent and that its finances are badly depleted. "Since the abrogation of the New York Agreement," says the *Journal*, the membership of the union "has not decreased. at all, and the membership books indicate an increase of over 4½ percent for the first eleven months of 1905. . . . The financial statement for 1905 will show a much stronger financial report than the one for 1904. Every debt and obligation has been promptly met."

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THE IRON TRADE REVIEW

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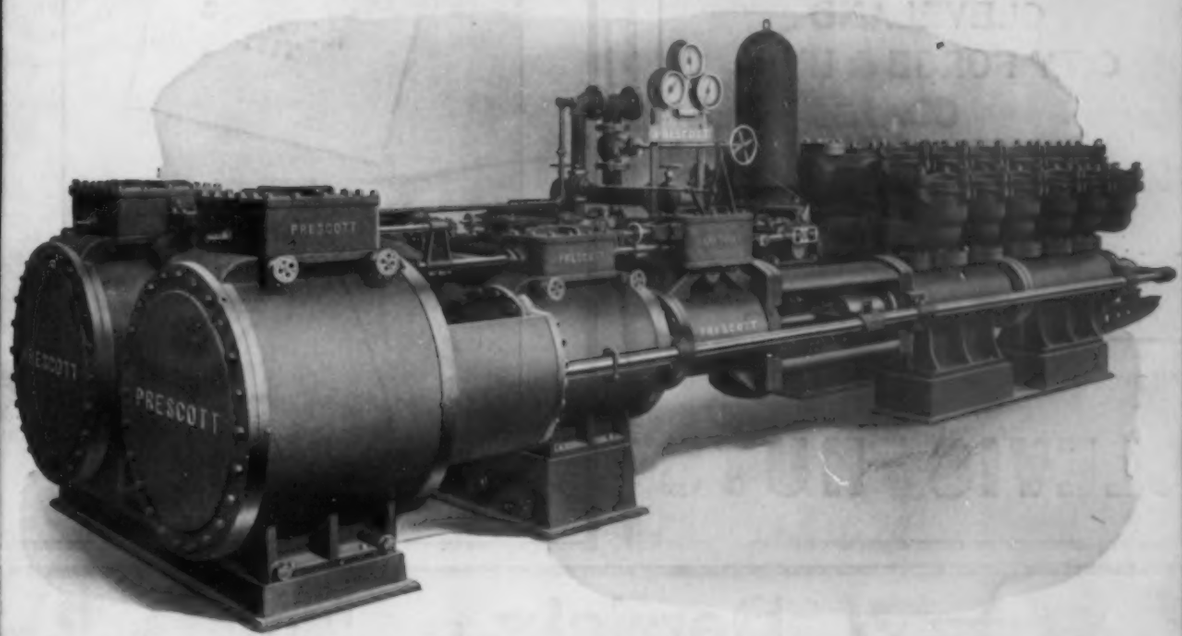
PRESCOTT PUMPS

MANUFACTURERS OF

PUMPING MACHINERY

FOR ALL CONDITIONS OF SERVICE



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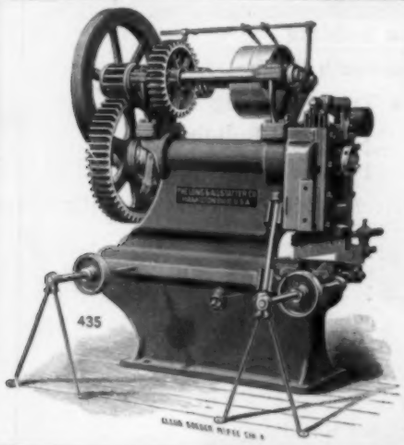

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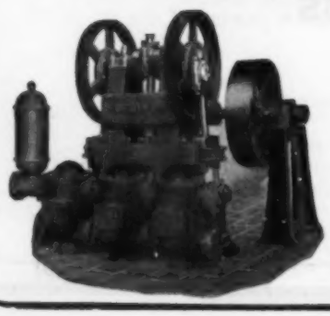

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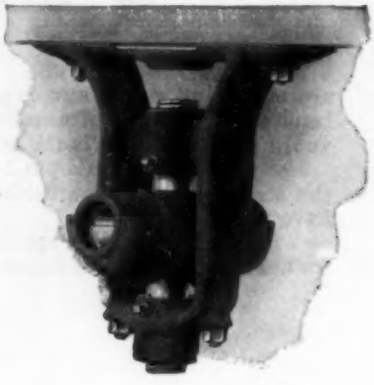

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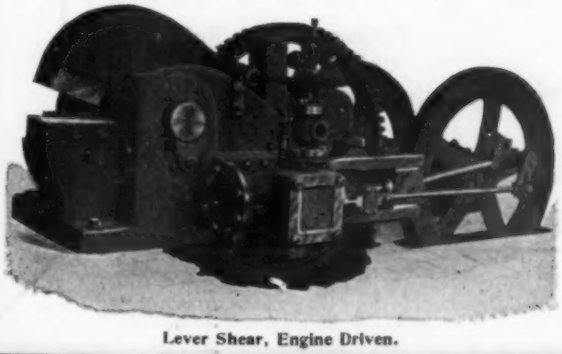

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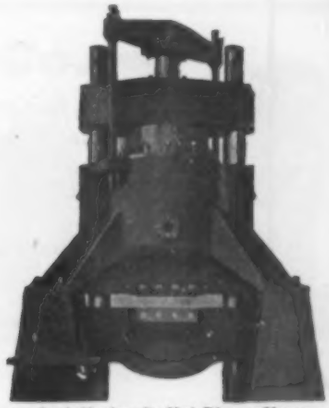

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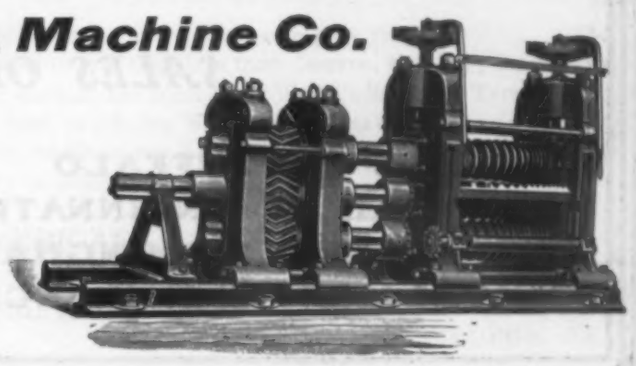

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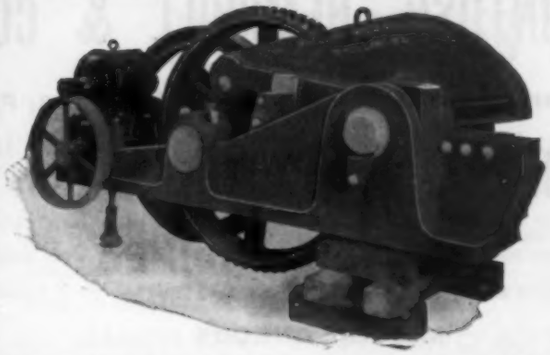

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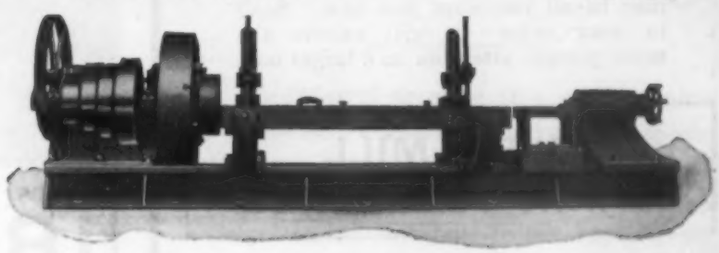

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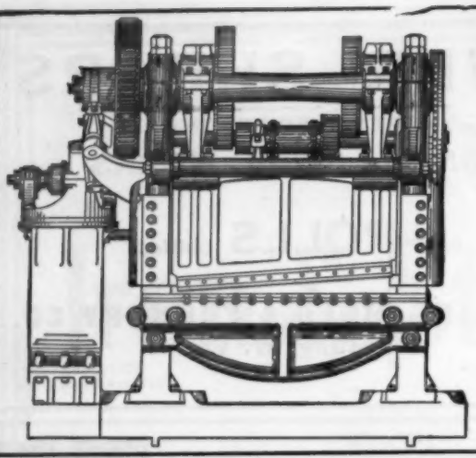

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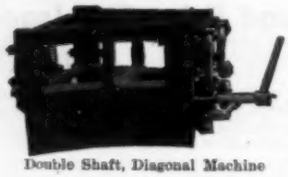

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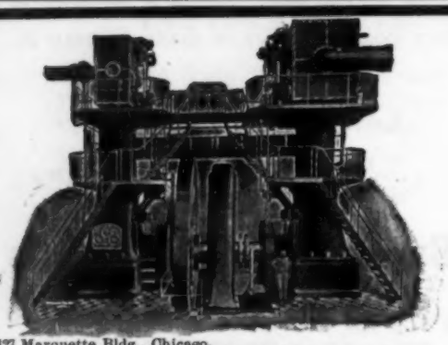

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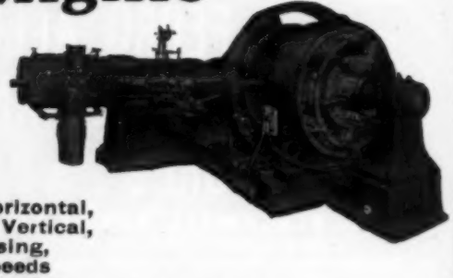

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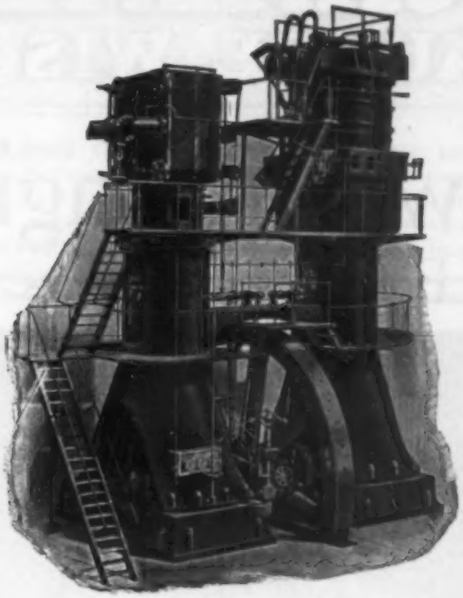

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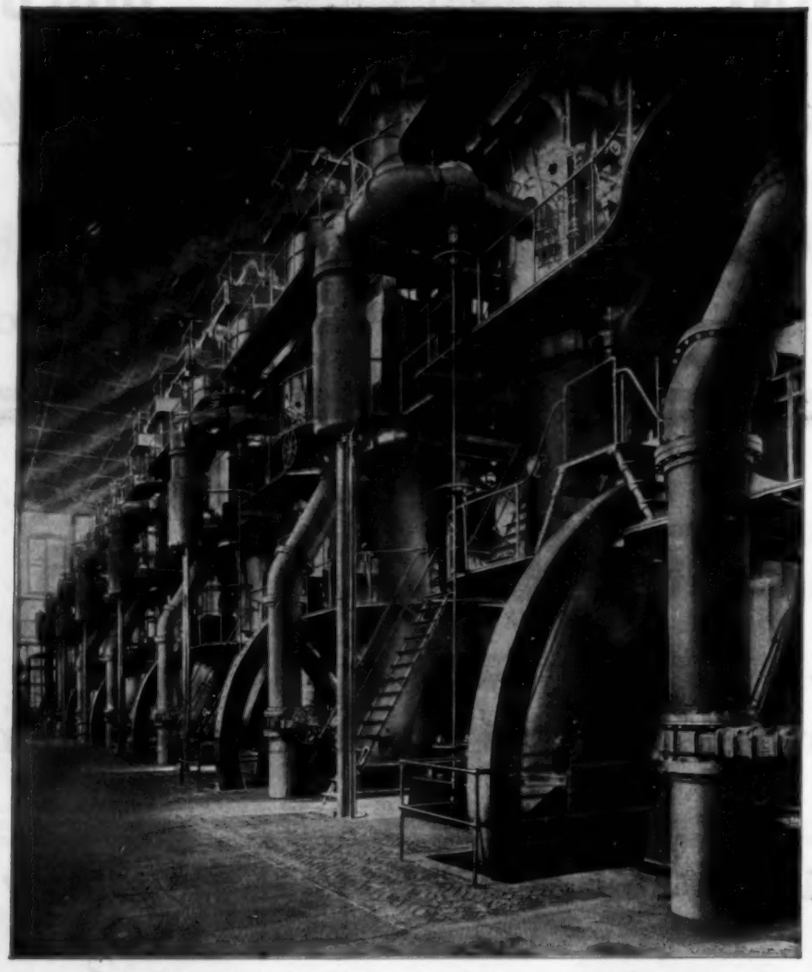

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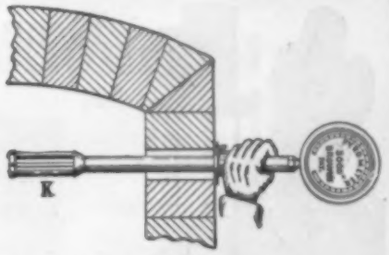

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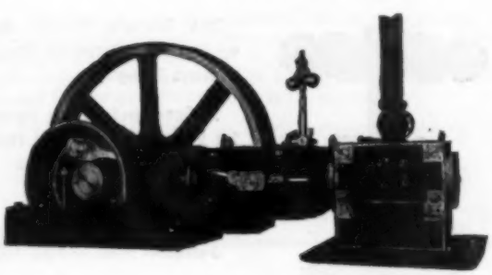

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50 Iron Plants

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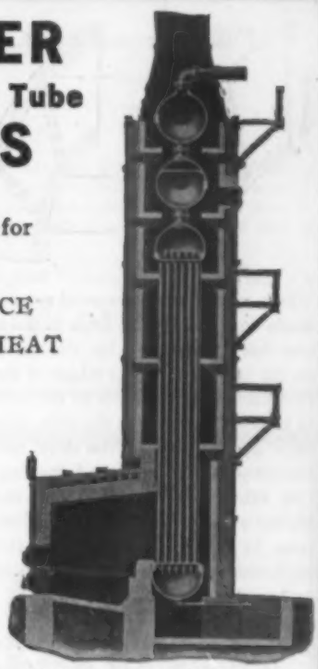

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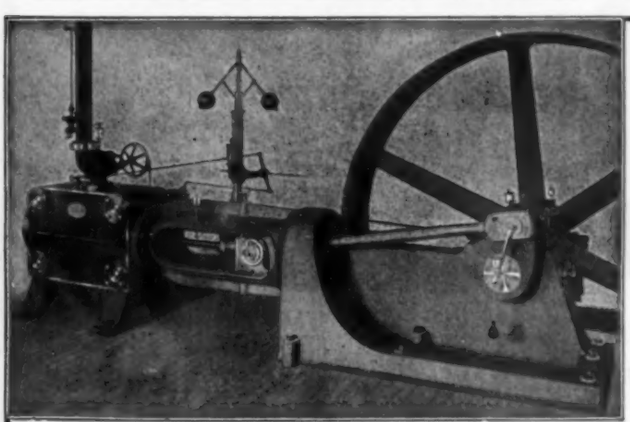
Coal Fired Boiler, 300 Horse Power

W. W. SHILLING

Sole Agent

SHARON, PA., U. S. A.



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Established 1867.

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High Pressure, Compound
and Compound Condensing.
Girder or Heavy Duty Bed.

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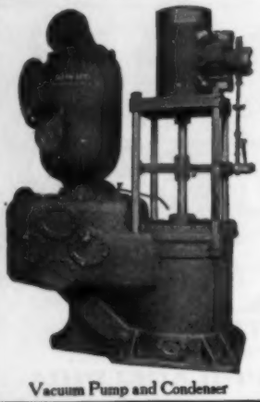

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Dean Bros. Steam Pump Works

INDIANAPOLIS, IND.

JET and SURFACE **Condensers**

ATLANTIC TYPE BOILER FEEDERS are the finest made.
DUPLEX PUMPS for all purposes; Hydraulic Pumps, with forged cylinders. Fly Wheel Pumps.
Get prices for our DURABLE DUPLEX PUMPS, and for our new pattern SIMPLE PUMPS.
All sizes of Vacuum Pumps up to 60 inch cylinders.

The largest line of pump patterns in America

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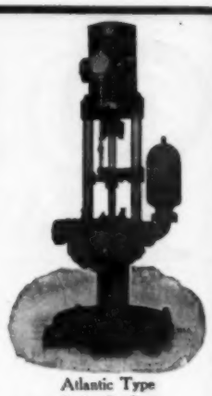
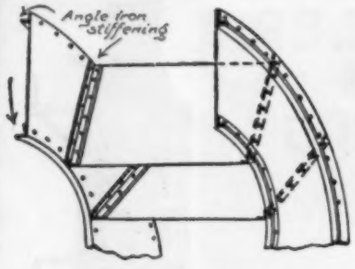


Atlantic Type Boiler Feeder



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In a recent advertisement we explained how our Fans were made more rigid and truer running than others (resulting in less back blowing) by the use of angle iron stiffening rings on the inner and outer edges of the side plates. We now wish to direct your attention to the short pieces of angle iron used to attach the floats to the side plates. Other makers simply turn up the end of the sheet metal float, greatly weakening the metal at the bond and making a very poor construction. Out attachment is rigid and sure. It costs us more, but it makes a better fan and that is just what we profess and purpose to make. We believe that the engineers and owners of high-class plants want reliable and workmanlike construction and will recognize it.

Send for our Booklet on FANS, BLOWERS and EXHAUSTERS, and, if you do not already have a copy, ask also for our Book on Fuel Economy.

THE GREEN FUEL ECONOMIZER CO.
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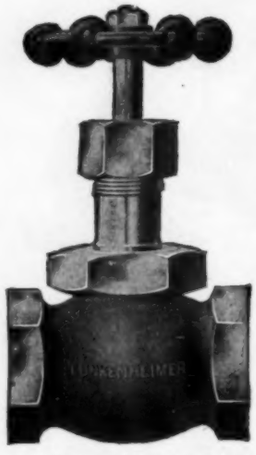

No Extra Parts Required to Repair Them when Worn.

A few minutes spent in regrinding and they are as good as new.

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I. T.

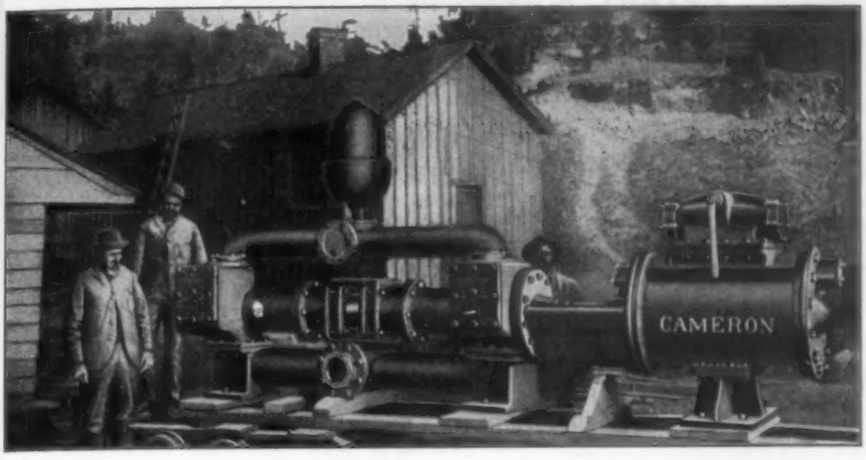
Who Builds the Best Nine Pump?

PRESCOTT!

Fred. M. Prescott Steam Pump Co., Milwaukee, Wis.

THE SLOGAN OF THE CAMERON—"CHARACTER: THE GRANDEST THING."

Cameron Pumps for Station Duty



Cameron Pipe Pattern Plunger Station Pump. Capacity 500,000 Gallons per Day, Being Placed in the Mines of the Montevallo Coal & Transportation Co.

This pump is especially adapted for station duty in mines and is far more durable than a piston pump for handling gritty water. There are no wearing parts in the water end except the packing in the stuffing-boxes, which can be instantly tightened up from the outside. Since the plunger works in loose sleeves, the pump barrel cannot be cut or worn by grit or sand, and the stuffing-boxes are placed in the center, so that there is no tendency for the plunger to sag. It is more compact than any other make of plunger pump, and has no outside rods or cross-heads. It is also adapted for feeding boilers under heavy pressure.

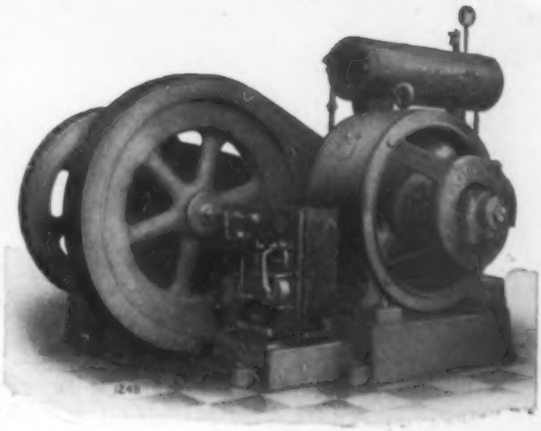
We will be glad to confer with any one about Pumping Problems, and will also forward our complete Catalog "D" on request.

A. S. Cameron Steam Pump Works,

FOOT OF EAST 23d STREET, NEW YORK, U. S. A.

ELECTRIC DRIVEN **COMPRESSORS**

The Latest Factor in shop economy; making pneumatic tools available in the small machine shop, without any boiler plant or added attendance. Air pressure is automatically maintained constant, without waste of power. Current is used only when compressed air is being applied.



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DO NOT be deceived by **PATENT MEDICINE** advertising methods applied to Machine Tools. Avoid complicated designs originated for talking and selling points only.

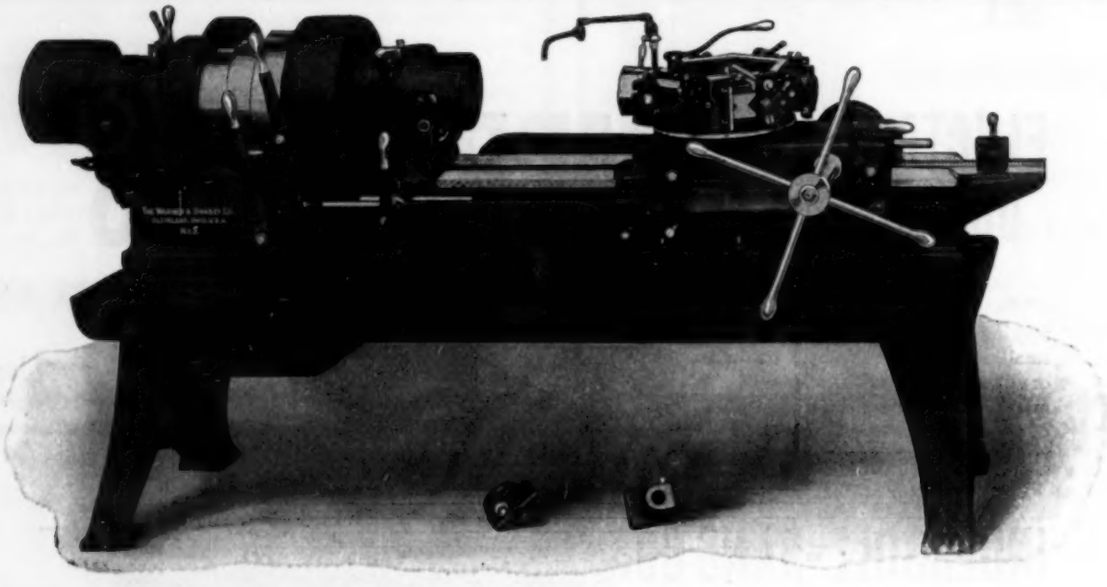
A single pulley drive means a short and noisy life. A Double Back Geared Cone Pulley is the best drive ever put on a Machine Tool. When properly designed, will give more power than required for ninety-nine one-hundredths of the work placed on the machine; will cover all high speed requirements; does not have to be topped by complicated countershaft mechanism; will give more spindle speeds and greater efficiency than any single pulley drive; will produce from ten to fifty per cent more work and will give the power put in the machine to the tool with the smallest possible loss.

This Drive and a great many other features, are on the "LEBLOND" tools and it will pay any prospective buyer to investigate.

We build Lathes and Milling Machines.

The R. K. LeBlond Machine Tool Co.

4609 Eastern Ave. **CINCINNATI, OHIO, U. S. A.**



Hollow Hexagon Turret Lathes— Three Sizes: 1⅜ x 15, 2¼ x 24 and 3⅝ x 36 inches.

For RAPID, ACCURATE, PRODUCTION.

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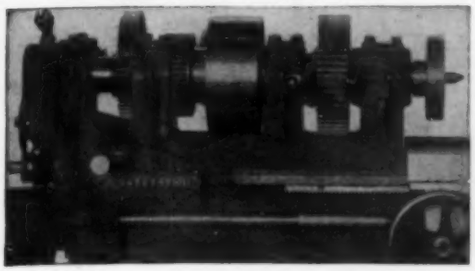
"More Lathe Work with Fewer Lathes"



Belt Contact

Belt Speed

Belt Tension

Means.

POWER-TO-DO-WORK

Belt Tension

Patent Head 300 lbs. Cone Head 180 lbs.

Belt Speed

(at maximum speed)

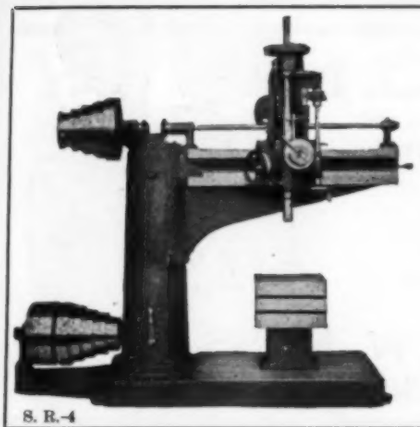
Patent Head 486 sq. ft. Cone Head 116 sq. ft.

Belt Contact

Patent Head 94 sq. in. Cone Head 21 sq. in.

Belt Tension - Speed - Contact, Spells Power.

The Lodge & Shipley Machine Tool Co., Cincinnati, O., U. S. A.



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FOR MANY CLASSES OF WORK

The chief characteristics of this machine are rigidity, simplicity and durability, which combined with a high ratio of transmission gears make it admirably adapted for many classes of work—it being particularly effective for heavy drilling and tapping—our 4 ft. size machine being able to pull a 6" tap through cast iron at 11 revolutions of spindle per minute.

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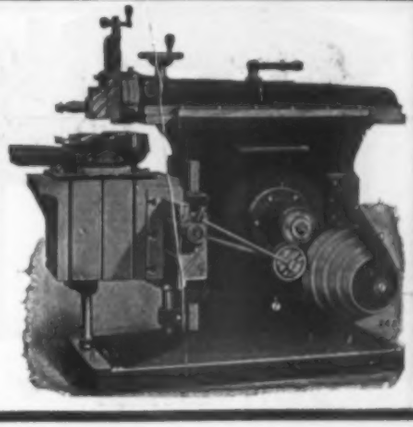

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unequalled for uniform ductility—accuracy in gauge and width and fine finish—for blanking, stamping and drawing.

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Our Steam Hammers are built with *Steel Frames* if desired, and are of the newest and most improved type. All sizes, from 200 lbs. to 25 tons falling weight.

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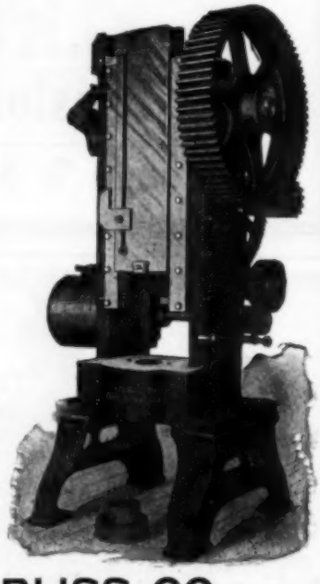

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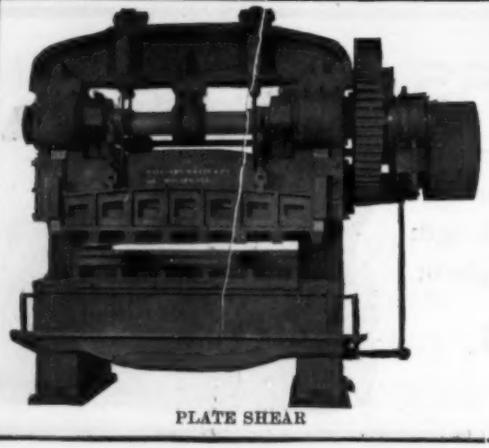

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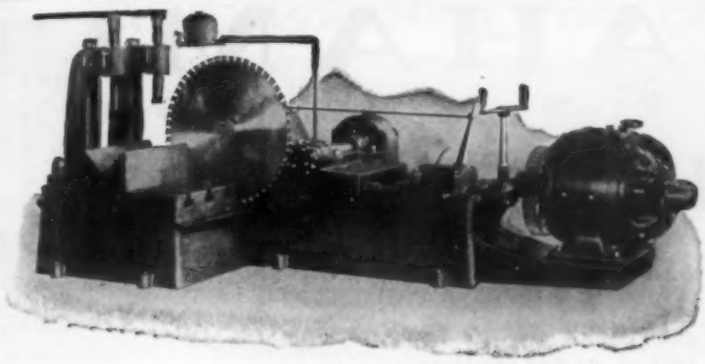

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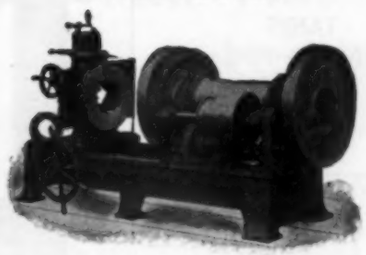

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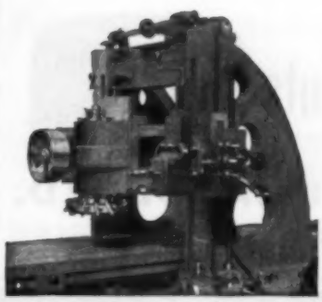

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OPERATED EITHER BY AIR OR STEAM.

The ALLEN RIVETERS are especially adapted for all descriptions of structural and bridge work and embrace in their construction special features not to be found in any other portable pneumatic riveting machines.

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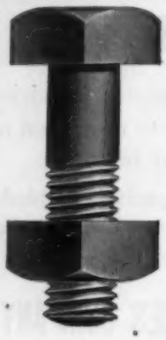

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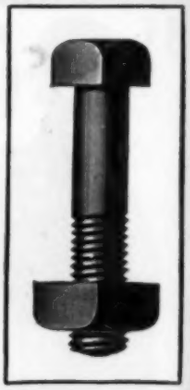

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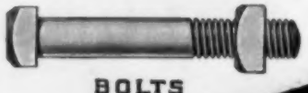

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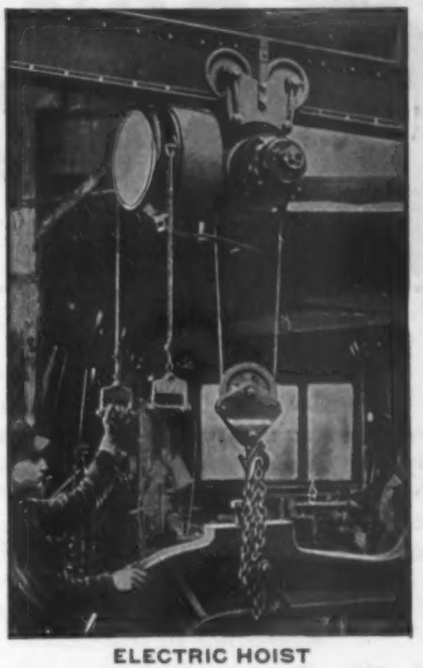

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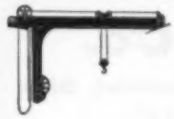

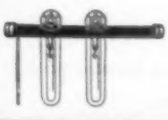

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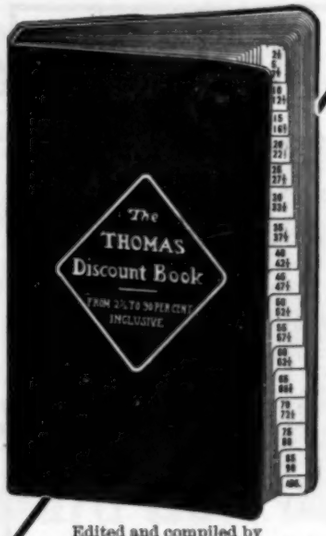

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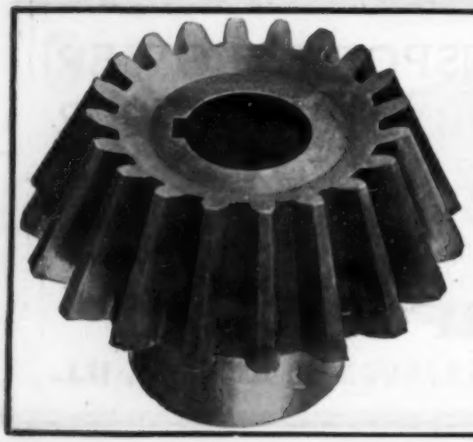

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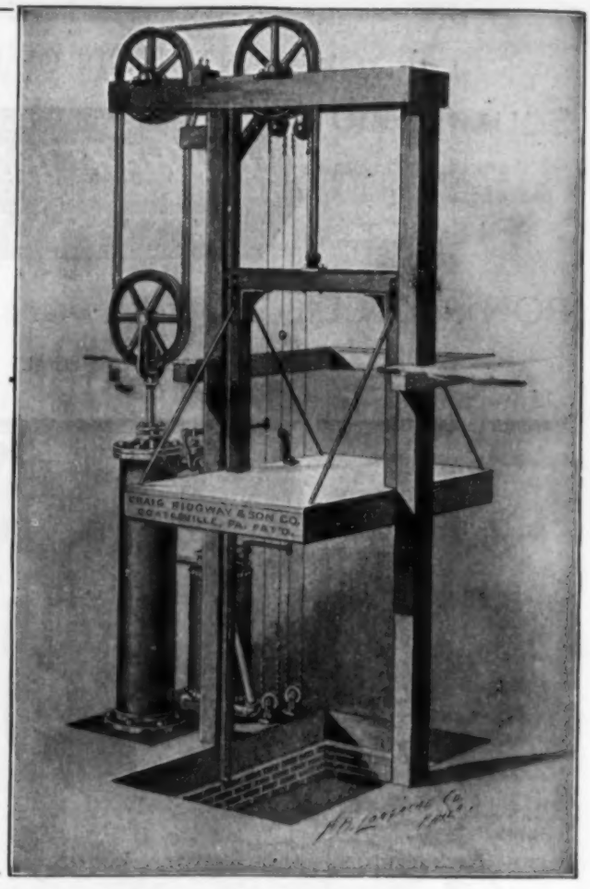

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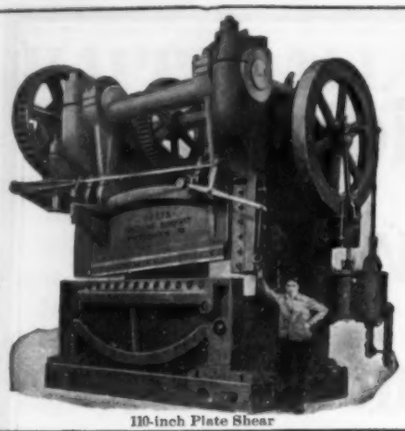

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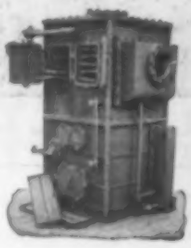

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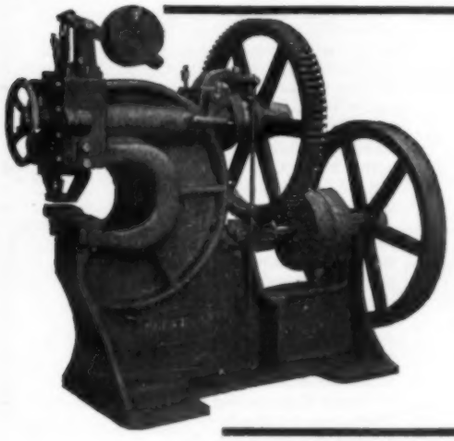

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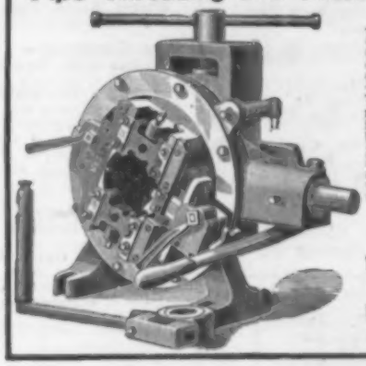

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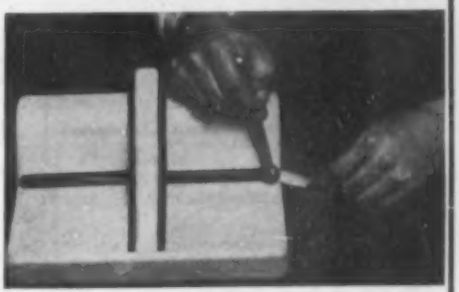

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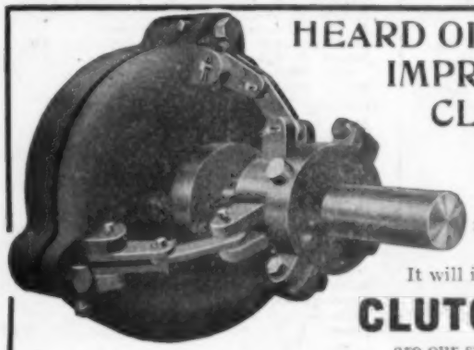

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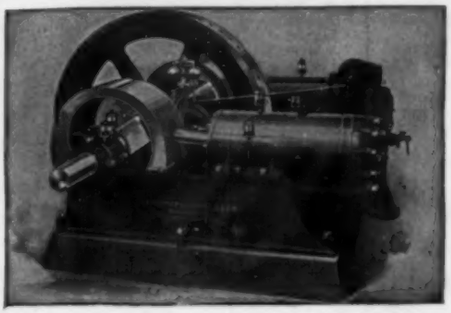

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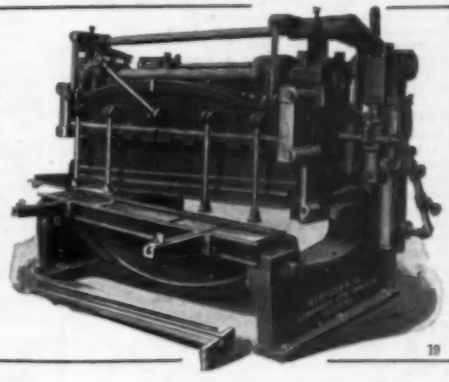

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Republic Iron & Steel Co., Chicago, Ill.
Joseph T. Ryerson & Son, Chicago, New York and Pittsburg.
Scully Steel & Iron Co., Chicago, Ill.
W. H. Thompson & Co., Philadelphia, Pa.
Wm. B. Walter & Co., Chicago, Ill.
L. & R. Wister & Co., Philadelphia, Pa.
West Leechburg Steel Co., Pittsburg, Pa.
United Steel Co., Canton, O.

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Birdsboro Steel Foundry & Machine Co., Birdsboro, Pa.
Brodesser Elevator Mfg. Co., Milwaukee, Wis.
Cleveland Punch & Shear Works Co., Cleveland, O.
R. S. Newbold & Son Co., Norristown, Pa.
Niles-Bement-Pond Co., New York.
United Engineering & Fdy. Co., Pittsburg, Pa.
Williams, White & Co., Moline, Ill.
Turner, Vaughn & Taylor Co., Cuyahoga Falls, Ohio.

Steam Specialties—
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A. S. Cameron Steam Pump Works, New York City.
Dravo, Doyle & Co., Pittsburg, Pa.
Eynon-Evans Mfg. Co., Philadelphia, Pa.
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Harrison Safety Boiler Wks., Philadelphia.
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Vandyck Churchill Co., New York City.
Jenkins Bros., New York City.
Pittsburg Valve, Foundry & Construction Co., Pittsburg, Pa.
R. D. Wood & Co., Philadelphia, Pa.

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Carnegie Steel Co., Pittsburg, Pa.
Reed F. Blair & Co., Pittsburg, Pa.
Bourne-Fuller Co., Cleveland, O.
Globe Rolling Mill Co., Cincinnati, O.
Arthur C. Harvey & Co., Boston, Mass.
McClintic-Marshall Cons. Co., Pittsburg, Pa.
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Russel Wheel & Foundry Co., Detroit, Mich.
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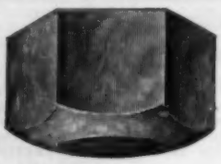

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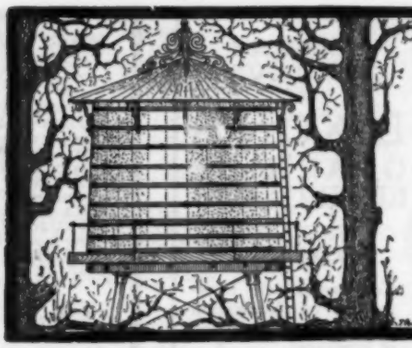

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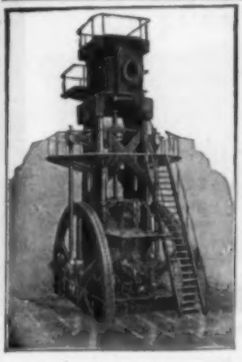

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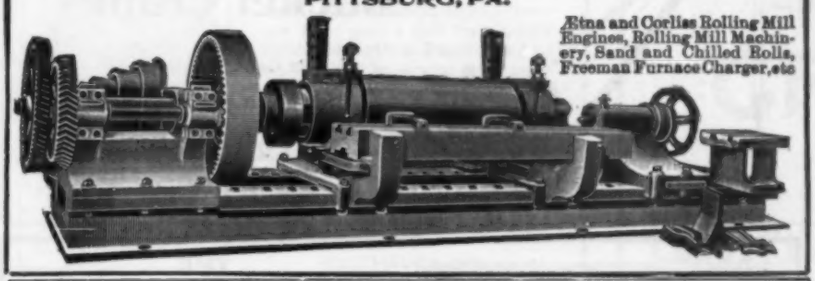

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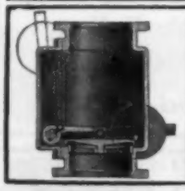

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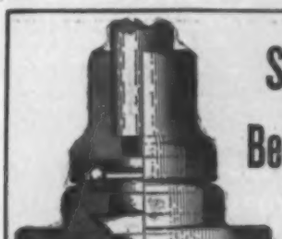

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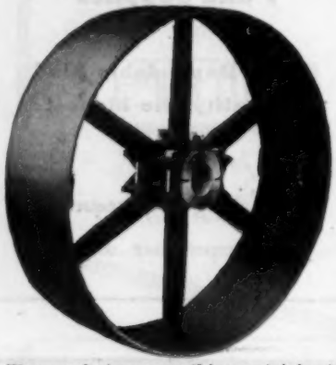

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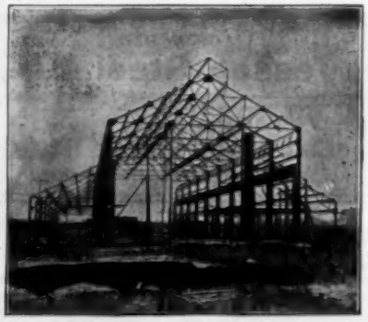

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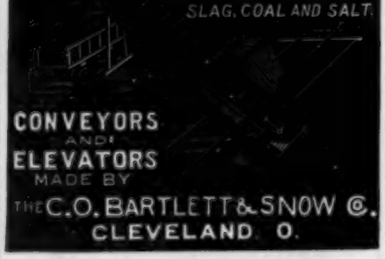

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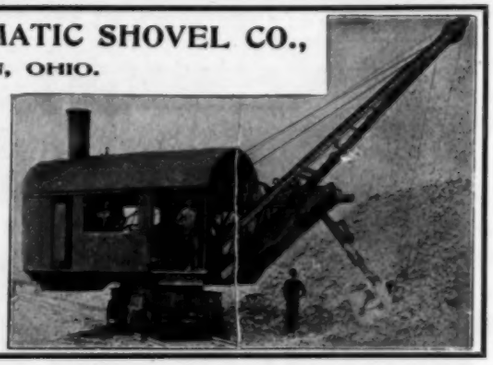

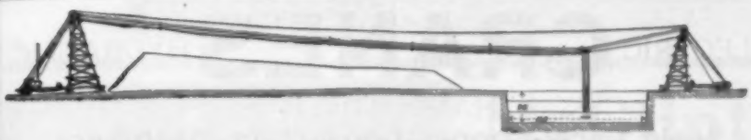

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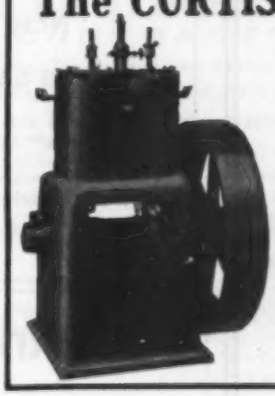

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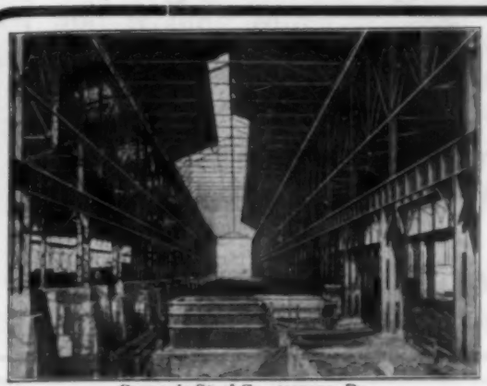

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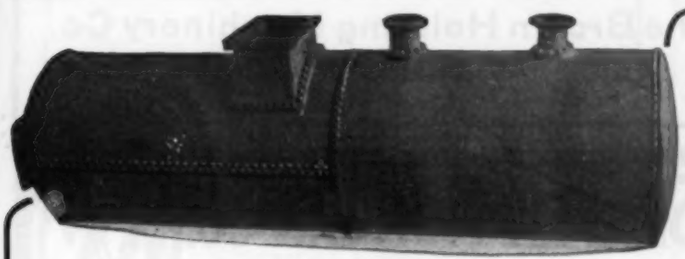

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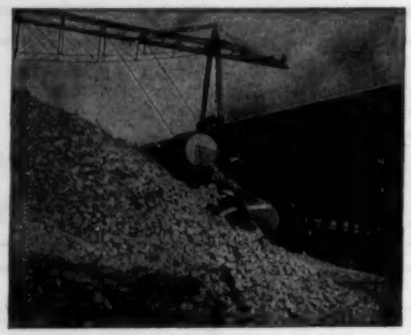

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1—32" x 14' W. P. Davis Engine Lathe, new. Special low price.

We want to buy choice second hand tools. If you have any for sale please let us have a list of them, and we will send a representative to look them over.

McDOWELL, STOCKER & COMPANY

59-61 So. Canal St. CHICAGO, ILL.

In Trade

We secure a great many excellent second-hand tools, and we often get some splendid bargains from concerns who are going out of business.

One Draper Engine Lathe	15" x	5'
One Draper Engine Lathe	16" x	6'
One Blaisdell Engine Lathe	16" x	6'
One Blaisdell Engine Lathe	18" x	6'
One Blaisdell Engine Lathe	18" x	8'
One Blaisdell Engine Lathe	19" x	8'
One Blaisdell Engine Lathe	20" x	7'
One Draper Engine Lathe	20" x	8'
One Draper Engine Lathe	20" x	23'
One Draper Engine Lathe	22" x	10'
One Draper Engine Lathe	31" x	20'
One Draper Engine Lathe	42" x	22
One Hendey Planer	22" x 22" x	5'
One Whitcomb Planer	24" x 24" x	5'
One Powell Planer	24" x 24" x	6'
One Gleason Planer	30" x 30" x	9'
One Wood & Light Planer	32" x 32" x	9'
One Betts Planer	39" x 32" x	16'
One Powell Planer (2hds)	36" x 36" x	10'
One Powell Planer (2hds.)	36" x 36" x	18'
One Pond Planer (1hd.)	37" x 32" x	10'
One Whitcomb Planer (1 hd.)	36" x 36" x	14'

One Blaisdell Upright Drill, 25" swing.
One Blaisdell Upright Drill, 30" swing.
One Lucas Toolroom Boring Machine.
Three Rivett Ball Case Grinders.
Write for what you need. We may have it.

Hill, Clarke and Company,

Boston, Mass., 156 Oliver St.
New York, 153 Greenwich, cor. Liberty.
Chicago, 14 South Canal St.
St. Louis, 504 Fullerton Bldg.

Alphabetical Index of Advertisers on page 72 this issue.

ROLLING MILLS

1 set 3-high 23" bar rolls.
1 28" Lewis blooming mill.
1 stand 3-high 18" closed top housings.

SHEARS

36" Leechburg R. H doubling and trimming shear.
36" Leechburg doubling shear.
22" upright punch or shear with 8"x12" upright engine.
Belt driven upright shear, 4½" throat.
8" Hogg hydraulic shear.
Totten upright side cutting bar shear, belt driven.

MISCELLANEOUS for STEEL WORKS and ROLLING MILLS.

Paxson 7' wet grinding pan.
Corrugating machine for sheets.

The above machinery for sale at cost price. Write at once.

WICKES BROTHERS

Cor. 45th St. and A. V. Ry. PITTSBURG, PA.

MACHINERY BARGAINS.

PLANERS—24" to 72."
LATHES—Several large sizes.
ENGINES—Corliss and Automatic.
DYNAMOS and MOTORS.
CONTRACTORS' MACHINERY.

Send for our new list.

THE BOSWORTH, DILLEY & HOLDING CO.

721-723 Rockefeller Building,
CLEVELAND.

MACHINE TOOL BARGAINS.

I have had placed in my hands for sale the complete equipment of a modern machine shop consisting of one Reynolds-Corliss 175 h. p. simple engine, lathes, planers, screw machines, milling machines, drills, boring mill, gear cutters, etc. Those of American manufacture that can be imported into the United States duty free I quote below.

LATHES.

One Lodge & Shipley 20 in. Pat. head engine type. Used less than 10 months. Price $350.

Pratt & Whitney 14 in. turret. All attachments. Price $280 to a quick purchaser.

Barnes 11 in. foot power lathe. Good as new. Price $50.

PLANER.

15" x 15" x 3' Pratt & Whitney. Used about one year. $300 cash takes it.

RADIAL DRILL.

One 4-in. Cincinnati semi-universal with tapping attachment. Price $250.

GEAR CUTTER.

30-in. Gould & Eberhadt. For spurs and bevels. Price $400.

Also a direct current lighting unit. 40 K. W. multi-polar. Western generator, direct connected to one Ideal, high speed, automatic, horizontal engine. Price $450.

Above machinery is guaranteed to be in perfect working order. For further particulars address:

ROBERT DUNCAN

LONDON, ONTARIO.

FOR SALE

Gas Stove and Range Plant

In Western Pennsylvania. Complete equipment, with modern foundry in connection for making gas stoves and steel ranges. Plant now in operation. Good reasons for selling.

Original cost plant $100,000; can be bought for $40,000. For further information, write

The CRESCENT MACHINERY CO.,

No. 1535 Williamson Bldg.,

Cleveland, Ohio.

STOCKER'S LIST

Used Machinery.

1—72" x 72" x 12' Pond Planer with 4 heads.
1—36" x 30' Double End Column Lathe, first-class working order.
1—30" x 16' New Haven Engine Lathe C. R.
1—30" x 26' Putman Engine Lathe, compound rest in good order.
1—32" x 16' Putman Engine Lathe, compound rest and taper attachment, in good working order.
1—50" Delano Pulley Lathe.
1—350-ton Elmes Hydraulic Press with Pumping Engine, fine condition, practically good as new.
1—Pels Power Punch, 24" throat, capacity for punching 1" x 1" in steel plate, fine condition.
1—34" Walcott Geared Shaper, in good working order.
1—26" Wolcott Geared Shaper, in good working order.
1—Lenox Rotary Slitting Shear, 4'-¾" capacity.
1—Ingersoll Air Compressor, 570 cu. ft. per minute.
1—Blake Air Compressor—Steam driven,—520 cu. ft. per minute.
1—4" Bignall & Keeler Pipe Machine.
1—4" Jarecki Pipe Machine.
1—2" Bignall & Keeler P. D. Q. Pipe Machine.

Also many other second hand tools.—Write us when in need of anything in the machine tool line.

We want to purchase good iron and brass working machinery; let us know what you have for sale.

The H. A. Stocker Machinery Co.

20-22 South Clinton St.,

CHICAGO.

FOR SALE

Three ~~Five~~ Blowing Engines

36" Steam Cylinder
84" Air Cylinder
54" Stroke

Engines were built by Cuyahoga Engine Works and can be inspected at our plant in Columbus, O. Can be delivered immediately.

THE COLUMBUS IRON & STEEL CO.
COLUMBUS, OHIO

SECOND-HAND MACHINERY.

LATHES

100" x 20' Heavy Lathe.
96" Face Plate Lathe.
63" x 18' Bement Forge Lathe.
42" x 20' Draper, triple geared, latest pattern.
31" x 14' Le Blond.
32" x 20' Draper, triple geared.
28" x 14' Blaisdell.
26" x 16' Draper, compound rest, latest pattern.
26" x 12' Bogart, compound rest and taper.
25" x 14' Gleason, double back gears.
24" x 10' Lodge & Shipley.
12" x 12' Draper, latest pattern
86" x 10' Lodge & Davis.
14" x 6' Bogart, with taper.
11" x 6' Flather, with taper.
24" x 6' American, 1⅝" hollow spindle.
13" x 6' Pratt & Whitney, with taper

PULLEY MACHINERY.

48" Stevens, Pulley Lathe, 2 tools.
36" Niles Pulley Lathe, 2 tools.
36" Stevens Pulley Lathe, 2 tools.
32" Newton Pulley Borer.
54" Sellers Pulley Borer.
60" Fly Wheel Lathe.

TURRET LATHES AND SCREW MACHINES.

42" Gisholt Gap Turret Lathe.
42" Lathe, with turret on carriage.
22" Lodge and Shipley heavy screw machine.
22" Bullard Turret Brass Lathe.
24" American Turret Lathe.
2" x 24" Jones & Lamson flat turret.
2" American, with forming slide.

PROFILERS.

One and Two Spindle Garvin.

MILLING MACHINES.

No. 24 Brown & Sharpe, 6' table.
Heavy Newton Slab Miller.
6—No. 2 Grant, Lincoln type.
3—No. 6 Grant, Lincoln type, heavy
No. 12 Brown & Sharpe.
No. 13 Brown & Sharpe.
No. 16 Kempsmith.

RADIAL DRILLS.

2—2½' Tapping.
2—3' Tapping.
2—4' Tapping.
5' Universal Drill Co.
Grant Semi-Universal.

BORING MILLS.

20" Niles, 2 heads, modern.
84" Sellers, 2 heads, modern.
76" Bullard, latest pattern.
72" Michael, 2 heads.
30" Rogers, turret mill.
4" Bar Betts Horizontal, 6' table.
2¾" Bar Bement-Miles Horizontal, 8' table.
2¾" Bar Bement-Miles Horizontal, 6' table.

GEAR CUTTERS.

22" Gould & Eberhardt, hand feed.
30" Gould & Eberhardt, spurs and bevels.
50" Gould & Eberhardt, spurs and bevels.

HAMMERS.

6,500 lb. Bell Single Frame.
4,000 lb. Morgan Double Frame.
100 lb. Toledo, with Peck Lift.
80 lb. Bradley Helve Hammer.

AXLE LATHES.

No. 2B Bement-Miles, late pattern.
Bement-Miles Axle Centering Machine.
Bement-Miles Axle Cutting-Off Machine.

PUNCHES AND SHEARS.

Pels Hand Punch, for 15" beams.

SHAPERS.

16" Gould & Eberhardt, back geared.
20" Gould & Eberhardt, back geared.
24" Gould & Eberhardt, back geared.

SLOTTERS.

9" Sellers Slotter.
10" New Haven Slotter.
15" Dill Slotter.

GRINDERS.

Heavy Landis Universal Grinder, 20" swing, 96" centers.

MISCELLANEOUS.

Barr Universal Tool Room Grinder.
14" Morton Keyseater.
Morton Portable Keyseater.
86" Face-plate Lathe.
Pels Beam Punch, hand power.
4-Spindle Nut Tapper.
Whiting Elec. Gib Crane.

Send for Prices and Full Particulars.

Marshall & Huschart Machinery Co.

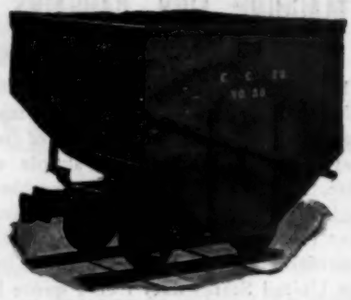
62-64-66 South Canal Street, Chicago.

No. 15 BILLET CAR.
Complete estimates furnished.
Write for prices.

INDUSTRIAL CARS

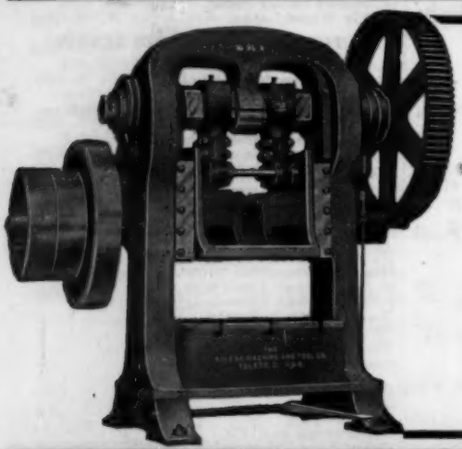
FOR
FURNACES
ROLLING MILLS
FOUNDRIES, POWER PLANTS

Builders of Light Cars of Every Description. Overhead Trolleys, Turn Tables, Switches, Frogs, Portable Track, Rails, Etc.



No. 50 ONE SIDE DUMP CAR.

THE CLEVELAND CAR CO., West Park, Ohio.



YOU WANT THE BEST—BUY OF US

"TOLEDO"
Double Crank Power Presses

Fitted with the "TOLEDO"
3-Engagement Sliding Block Clutch
with patented Gravity Releasing Device

REQUIRE LESS POWER
EXERT MORE PRESSURE
GIVE BETTER RESULTS
than Presses Fitted with Friction Clutches

The Toledo Machine & Tool Co.
Toledo, Ohio, U. S. A.

AGENTS:— Selig, Sonnenthal & Co., 85 Queen Victoria St., London, England.
Ludw. Loewe & Co., Berlin, Germany.

Russel Wheel & Foundry Co. Detroit, Mich.

DESIGNERS AND BUILDERS OF

Light Railways and Cars for Industrial Plants

DUMP CARS MINE CARS LOGGING CARS

Elevating and Conveying Machinery

SPECIAL MACHINERY

STEEL STRUCTURES AND BRIDGES

Great Lakes Engineering Works

DETROIT, MICHIGAN

Builders of

VERTICAL ENGINES

For

MARINE or STATIONARY SERVICE

ANTONIO C. PESSANO, President and Gen'l Manager.
GEORGE H. RUSSEL, Vice President.
JOHN R. RUSSEL, Sec'y. & Treasurer.

Full line of Patterns

Drills
Sockets
Reamers
Taps
Cutters
Etc.

SPECIAL TOOLS TO ORDER

ESTABLISHED 1874

"Cleveland" Tools are tools for service.

INCORPORATED 1904

CATALOG ON REQUEST

THE CLEVELAND TWIST DRILL CO.

Factory and Office, CLEVELAND, OHIO.

New York Salesroom, 62 Reade St. Chicago Salesroom, 17 So. Canal St.

OUR TRADE MARK ON TOOLS IS SYNONYMOUS OF MERIT.

MERIT UNEXCELLED.

TRADE MARK

1

The Horsburgh & Scott Co.

1246 Hamilton St. CLEVELAND, O.

We manufacture

all kinds of Metal Gears

and

NOISELESS RAWHIDE PINIONS

QUALITY SERVICE

We build Cars of all kinds

Mine, Furnace and Rolling Mill Cars a specialty.

Core Oven, Foundry Charging and Industrial Railroad Cars adapted to every need.

Write for Catalog.

The Atlas Car & Mfg. Co.

CLEVELAND, OHIO.

EMERY GRINDER

Gen'l European Agts:
Selig, Sonnenthal & Co.
Queen Victoria St., London, Eng.

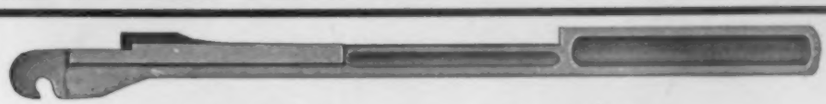
Stow Flexible Shaft

Take the tool to the work in place of the work to the tool.

For Drilling, Tapping, Reaming and Grinding on large work it is a great money saver.

THE STOW MFG. CO.
Binghamton, N. Y.

Established 1875



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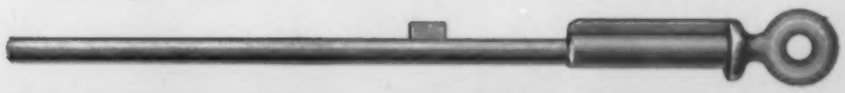
Manufacturers of

HIGH CLASS DROP FORGINGS SPECIAL

Factories at

Worcester, Mass. - Cleveland, Ohio.



When you are in need of
Iron, Tool or Machinery Steel,

FORGINGS
Of any description,
Rings, weldless,
Gear blanks,
Iron and steel dies,
Nuts,
General jobbing,
Spindles, **Ball Trunnions**, Crank Shafts,

SMOOTH FORGED OR ROUGH TURNED,

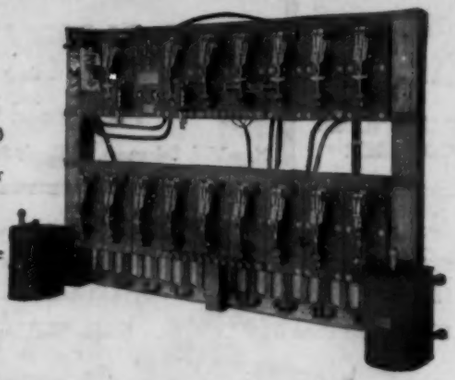
Write to us.

We are also equipped for Carbonizing, Case-Hardening and Annealing

JOS. DYSON & SONS
Cleveland, Ohio

TYPE MAGNETIC SWITCH
CONTROLLERS
For Excavating and Conveying Machinery
WE ALSO BUILD
Special Controllers for Special Service

Controller for 2-185 H. P. 220 Volt Motors for Hoist, Cross Travel, and Bridge Motions.



The Electric Controller & Supply Co.

Main Office, CLEVELAND, OHIO

509-510 Woodward Bldg., Birmingham, Ala.
200 Fremont St., San Francisco, Cal.
515 Frick Building, Pittsburg, Pa.
1621-29 17th St., Denver, Colo.
136 Liberty St., New York.

47 Victoria St., London, England.

Tool Steel Department.

Our Tool Steel trade has grown to such proportions that we have found it necessary to add a Tool Steel Department devoted exclusively to this part of our business. Practical tool steel men will be glad to demonstrate any of our steels in your shop.

Address inquiries and orders to
Tool Steel Department.

Write for new Tool Steel Catalog.

THE
BOURNE-FULLER CO.
IRON STEEL
PIG IRON
COKE
Cleveland, Ohio.

STEAM SHOVELS
ALL SIZES
Traction Shovels, Ballast Unloaders, Dredges and Ditchers for Mining and all other purposes.

Our shovels are specially constructed to meet the requirements of mining. We have sizes suitable for all classes of work. We manufacture our own boilers, chains, steel and grey iron castings.

Write us fully as to your needs. We can supply them.

The Marion Steam Shovel Co.

640 West Center St., MARION, O.

G. W. BARNHART, Western Manager, No. 4 Sutter Street, SAN FRANCISCO, CAL.
F. H. HOPKINS & CO., Representative, MONTREAL, QUEBEC.